

The AUTOMOBILE

The History of the American Automobile Industry

Opening Chapter of History of America's Great Industry—
First Time the Complete Story of Early Endeavors Has Been
Told—To Be Published Serially and Later in Book Form

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This Issue—The Scope and Early Efforts

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By David Beecroft

THE practical and continuous development of the gasoline-engined automobile in America dates back to 1891; the first application of an electric motor coupled with a battery to propel a vehicle dates to approximately 1884, marking the advent of the pioneer, but the practical start of the electric vehicle industry dates from 1893 or 1894; and the pioneer in building steam road automobiles or locomotives as they were then called goes back to 1769, when the movement had its inception, although steam automobiles, as we now know them, date back little further than 1887, when our pioneers brought out their initial machines for passenger use.

Idea Is Centuries Old

The concept of building a vehicle that would run without horses is centuries old: Visions of the motor vehicle are recorded in Holy Writ, our ancient historians record prophecies by the great scientists; and poets wrote centuries ago of the possibilities of the fleet motor vehicle that would navigate the seas, traverse the land and cleave the air. While the practical development of the automobile in America covers a span of thirty-five brief years, yet the brains of earlier days handed to our inventors and pioneers of the present generation the essentials of the automobile as we know it to-day. Hence to get the broad perspective of the history

of the automobile in America it is necessary to review the recorded efforts of the last 50 years both in America and Europe, for in them we find the roots of the many constructions constituting the warp and woof of the present-day car.

First Internal Combustion Engine

In 1791 Barber's internal combustion engine marked the first recorded effort from which the gasoline engine of to-day is the offspring. The thread of progress was slow and it was not until 1876, when for the first time the charge of gasoline vapor was compressed that the possibility of the high-compression engine of to-day was a reality. It was 10 years later before Daimler and Benz in Germany gave us their engines, and in 1892 before Charles E. Duryea and his brother Frank gave us our first practical American gasoline automobile.

Pneumatic tires were made and used in 1845; the differential gear as used in the rear axle dates to 1828, when a Frenchman, Pecqueur, used it; the pivoted axle ends carrying the front road wheels were used in 1818, nearly a century ago; we have had the irreversible steering gear since patented by Jentaud, a Frenchman, in 1878; the use of the hot tube for igniting an explosive mixture takes us back to 1791; the use of the electric spark in ignition was recorded in 1853; and the use of springs, wheels, frames and other essentials carries the

reader far back into other centuries of the past.

To trace the growth of the automobile, as suggested by these conspicuous landmarks, it is imperative to turn back the pages of a century or more and analyze the outside influences that were factors in stimulating the industry or retarding it. War, always a retarder, exerted its influence a century ago, hostile road laws held the movement back in certain countries and the lack of improved roads exerted a strong retarding influence.

A Tremendous Subject

Yet, no apology is needed for a history of the great and still rapidly growing American automobile industry, but having delved into the earlier facts connected with the industry further than has heretofore been attempted in America, we recognize better than our readers possibly can how much limited space and time have compelled us to leave undone and although giving a great amount of information that is new to them and to the world at large, we regret that the limitations mentioned do not permit us to make it larger.

While it is well known that histories in general recite only the main parts and leave unmentioned the less important ones, it is not so well recognized in a history of this kind, that it is the exceptional which received mention, while the more common or commonplace, even though equally good, is neglected. The thought that, "Full many a flower is born to blush unseen and waste its sweetness on the desert air," has been constantly exemplified in connection with the automobile industry.

Foreign Influence

While it has been our intent to confine ourselves to the history of the industry in America we have been forced to constantly refer to work done by foreigners for several reasons. The ancient history is as much our inheritance as that of any other people and we give in these pages the more important points therein that our readers may understand the age and growth of this history-long problem and its bearing on our modern productions. The publications of foreign countries reach America much more freely than American publications go abroad because of the fact that many of our people or their immediate ancestors were foreign born and therefore take interest in things happening abroad. Our most liberal patent system is taken advantage of by foreign inventors quite freely and on these accounts foreign influence and foreign work have very materially affected American development and cannot therefore be ignored in an unbiased American history.

Several other factors have influenced the industry in America that were not felt or were felt to a much different degree in Europe. Probably the most important of these is the road problem. In this new land there are almost no roads whatever in the sense that the improved highways of Europe exist. At the beginning of the modern automobile movement there were practically no improved roads in this country. The rise of the automobile and modern road building in America have been

exactly contemporaneous. In 1891 New Jersey passed the first road improvement bill and the first American automobile was begun by C. E. Duryea. Straggling road improvement and likewise straggling growth in the automobile industry during the next seven or eight years, but a considerably increased activity both in roads and automobiles thereafter. The difficulties imposed upon our automobile inventors by our money wasting excuses for roads, has been a matter of comment by foreigners visiting us ever since we arose to the dignity of a nation.

A second very important factor has been the cost of horses and horse feed. In this land of broad area and fertile acres feed has been so cheap and horses so plentiful that the incentive to secure transportation other than by animal power and thus save hay and oats has not appealed to our inventive minds or our buying public as it has in the more thickly populated European lands where horses have been much more of a luxury. The very commonness of the horse made him the companion of all our people to such an extent that few believed he could be displaced in their hearts by a mere machine, no matter how swift or how economical it might prove to be. So certain were several of our automobile pioneers that no one able to afford a stable and hold the lines over a lively, intelligent and beautiful animal would ever purchase or drive for pleasure a machine vehicle that their earliest efforts were directed toward supplying transportation for those city brothers, who could not afford or whose surroundings would not permit maintaining a horse and stable. Such a view naturally did not encourage work toward a solution of the automobile problem. The limited market and the certainty that the price must be low and perhaps taken in installments made it necessary that the vehicle should be of the cheapest possible design and construction, and it was not until experience gained by riding on his brains showed that the motor vehicle opened a new world that Duryea and his brother Frank began in 1893 to develop the automobile for the high-priced market. It takes time to establish a manufacturing industry or create a manufacturing people, and naturally the newer country remained an agricultural one and looked to Europe for its mechanical supplies.

American Inventions

In spite of these and other reasons American inventors made a record to be proud of, and although not so numerous because our population was not so large and perhaps not so successful, for reasons above given, yet the records show that they were not laggards, but were closely in touch with the world's progress and often leading it; in fact, the record frequently shines with such brilliance that every patriotic American must glow with pride and should wonder if our national recognition and treatment of the American inventor is as liberal as his efforts and devotion to his work merit. The steamboat, the ironclad, the telegraph, telephone and electric light, the grain harvester, the submarine and aeroplane are familiar examples of

American ingenuity leading the world, and our pages will show a goodly number of such examples in the automobile business.

Solving the Problem

No mechanical problem, except possibly flying, remained unsolved so long as this one of self-propelled vehicles, and no problem has ever had expended upon it so large an amount of thought, effort and money in so many parts of the world or by so many people or under such widely divergent conditions. While it is true that many hinderances, particularly bad roads, and in some cases restrictive laws, hindered or stopped the work, it is safe to assert that no mechanical problem has proved so difficult of solution as this one and it has required not only a very high order of mechanical ability, but the growth of mechanical progress and the combination of ideas from many sources in order to accomplish it.

In writing the history of the automobile in America it is almost paradoxical that there is no first. Each man had been preceded by work which led up to his efforts and, which if he knew of them, undoubtedly assisted him materially. In passing judgment upon the work of the various people care must be exercised to note whether he was an originator or whether he was simply a sporadic worker, who did very little outside of his single effort and who added very little to the final result; or, whether he was persistent and kept his work going ahead until it did finally affect the entire industry.

Judged by these standards, we find that, although the automobile industry could have been developed many years earlier, using the material at hand and using no new devices whatever, it was not until certain persistent individuals came along who, having taken up the work and put their hands to the plow, continued until the industry became influenced by their work. Judged by this standard Charles E. Duryea, Ellwood Haynes and Alexander Winton were the pioneers in the gasoline vehicle work; Morrison & Salon were pioneers in the electric, and S. H. Roper, followed by George E. Whitney were the steam pioneers. R. E. Olds, Henry Ford, King and others followed close after as did Woods and the Stanley brothers.

Ancient Vehicles

The self-propelled carriage concept is undoubtedly almost as old as carriages of any form. The drag or sled which slid down a hill without assistance was not only the first self-propeller, but with no less doubt awoke within the mind of its possessor a desire to enjoy similar self-propulsion on the level and up hill just as every child coasting with his sled desires this thing. That our records of the automobile do not go back so far is not because the idea did not exist, but because it was not successfully carried out.

The oldest recorded vehicles are Egyptian war chariots whose pictures are sculptured on the enduring monuments dating back probably 2000 years B. C. The wheels of these chariots varied

from 30 to 39 in. and thus corresponded very closely with modern automobile sizes.

The first written mention of vehicles is in the Bible, where Joseph sent wagons to assist in moving his relatives. By the time of Solomon, some 500 years later, chariots were so plentiful as to be mentioned in thousands, and it is at about this time that the first written mention of the automobile idea is found in Homer's Iliad, 18th Book. That it is not found sooner is more probably due to the fact that writing itself was new at the time of Moses and the alphabet very imperfect (16 consonants only) until about the age of Solomon and Homer.

The Art in Homer's Time

That the arts of carriage making were considerably advanced in Homer's time (1000 B. C.) or before, is conclusively shown by mention in the fifth book of the Iliad, where the advantage of using a different metal for the bearing than that used for the axle is clearly indicated in the assembling of Juno's chariot:

"by Hebe, ever young,

The whirling wheels are to the chariot hung.

On the bright axle turns the bidden wheel

Of sounding brass; the polished axle steel.

Eight brazen spokes in radiant order flame."

These wheels undoubtedly were cast in a single piece just as the one-piece steel wheels used on many heavy trucks to-day, and there is some indication in the text that they were even turned, or in some manner machined on their circumferences.

The following quotation shows plainly the existence of the conception of self-propelled vehicles in Homer's time. He describes Juno as seeking aid from Vulcan the lame blacksmith and—

"There the lame architect the goddess found,
Obscure in smoke, his forges flaming round,
While bathed in sweat from fire to fire he flew;
And puffing loud, the roaring bellows blew.
That day no common task his labor claimed;
Full twenty tripods for his hall he framed,
That placed on living wheels of massy gold,
(Wondrous to tell) instinct with spirit roll'd
From place to place, around the bless'd abodes
Self-moved, obedient to the beck of gods."

Iliad 18th Book.

From other sources also we learn of self-moving apparatus in use in the temples before the Christian era; the priests being leaders in mathematics and mechanics in those times. How these devices were moved is not known, although some very ingenious arrangements for other purposes have come down to us. It is practically certain that the first forms of vehicles that were not drawn were propelled by man-power often concealed for the mystification of the public or for protection from the enemy. The Ethiopics of Heliodorus mention a triumphal wagon as having been used at Athens, which was moved by men carried therein and similar references are found in other authors. The moving forts or shields used by armies were carried or pushed rather than propelled and can hardly be considered mechanical devices. Friar Bacon

wrote in the thirteenth century of mechanical possibilities and said, "it will be possible to construct chariots so that without animals they may be moved with incredible speed." Certainly the racing creations of to-day would amply satisfy this speed prediction.

Chinese Wind Wagons

Vehicles propelled by a rowing or pushing action and also by sails were seen in China by western travelers in the fifteenth and sixteenth centuries with no record as to their first use, which may have been centuries before. Sails are still used in China to assist in propelling their crude wheelbarrows or carts, but they are hardly independent of man power and therefore not proper examples of this art.

Beginning with about 1600 sailing carriages were made in Europe by the celebrated mathematician, Simon Stevin of Holland. One in particular carried five passengers and another had a capacity of twenty-eight passengers. This latter was simply a box on wheels with two masts and sails and with the rear axle arranged so that it might be steered. In short, a boat running on wheels instead of on water. A description of a trip made in the larger car recites a run of 42 miles along the Dutch coast in two hours with full passenger load. The smaller carriage was kept at Scheveningen as late as 1802, but had not been used since 1748.

The rope or chain steering cable wound around the steering column and much used on traction engines and more recently on cycle cars, dates back to a Holland wind wagon of 1740.

The Use of Kites

Many other accounts of wind-driven vehicles are to be found which carry this art down to the present day and include sail-driven vehicles on the prairies of the central United States as well as sail-driven bicycles and skate sailing, both popular sports in some localities.

One of the most interesting accounts of wind-driven vehicles is found in Pocock's "Navigation in the Air by the Use of Kites or Buoyant Sails, 1827," in which he describes many trips made about England and also fishing vessels driven by means of his controllable kites. By the use of three or four cords he was enabled to make his kites pull strongly or float lightly on the air at will and also to tack one side or the other just as sails are set at an angle to the wind which, coupled with a proper steering device, enabled his vehicle to be run almost into the teeth of the wind. Speeds of a mile in 3 min. were frequently attained and fishing smacks drawn by kites traveled much faster and were not becalmed so often as those dependent on sails.

The use of springs for carriage propulsion was suggested early and has persisted until the very end of the last century. The first known attempt was made in Paris by an Englishman in 1644. Patin tells us "this carriage was intended to run from Paris to Fontainebleau and back in a single day," and that it was thought there would be "a great economy in hay and oats." The device ap-

parently worked well on a floor, but anyone knowing the amount of power required by a successful motor vehicle can readily understand that winding these springs by men would not be a practical method. Another attempt with a spring motor was made by Vegelius, a Jena professor, who in 1679 made a spring-propelled horse covered with the skin of a real horse, which on level ground was able to cover 4 miles in a day. How often it required winding or how long to wind is not stated.

Propulsion by Spring Power

The spring carriage problem again and again received attention with each wave of development of locomotives or railways and in the latter part of the last century several very serious attempts were made to propel street cars by the spring method. The almost level and practically perfect track permitted carrying a heavy load of springs while the possession of mechanical power for winding them removed one of their most objectionable features. Steel making had progressed by this time so that much better and much larger springs were quite possible to secure. Among these attempts may be mentioned a spring-driven omnibus tried in New Orleans in 1870, a street car tested in Philadelphia later, and another one tested between Richmond, Va., and Manchester in 1891. This car weighed about 1000 lb., carried ten people on a successful trial trip and employed eight springs, each formed of a strip of steel 8 ft. long by 18 in. wide by 3/32 in. thick, estimated each at 2 hp. or a total of 16 hp. Suitable mechanism permitted applying one or more springs at a time as the amount of power was needed.

Many Patents Sought

The latter part of the century embracing about thirty years, from 1866 to 1897, shows a very considerable activity in spring-propelled vehicle designs. This activity is coincident with great activity in other lines and a part of that larger movement of the national life toward a much wider manufacturing and distributing activity which began to develop after the Civil War. United States patent records show fully fifty different attempts before 1900, but they are of very little interest to the motor vehicle art because they were in no sense permanently successful nor did they add anything to the stock of knowledge or the mechanical devices needed to make the industry a success. On the contrary, they show evidence of being rather the efforts of those who were not well posted either as to the requirements or the history of the art and who, therefore, could hardly be expected to add anything to it.

While in general the self-propelled vehicle is designed to displace the horse, a part of the progress to this end has been the construction of vehicles propelled by horses employing treadmill or turntable mechanism. It was quite early recognized that, given good roads or a good track, animal muscle can be expended to better advantage than in the natural process of walking or running and that a horse may propel the vehicle and himself

farther and faster than he can pull it just as a cyclist can cover two or three times as many miles in a day in spite of the added weight of his machine than he could possibly do afoot. In 1824 Snowden, a British mechanic, proposed a two-story turntable or merry-go-round, on the lower floor of which the horses walked in a circle to propel the structure. He seems to have had the then very common notion that to get traction cogs were necessary, and his vertical driving shaft seems to have extended down into a slot in the road with a pinion on the lower end meshing into a rack in this slot. Stevenson, known for his locomotive, claims to have had designs for a treadmill device and one of these, Brandreth's cyclopede, was tried on the Liverpool and Manchester Railway in a competition held in 1829. It failed to attain speeds higher than 5 or 6 miles per hour.

Other experimenters frequently had this idea in mind, which is not to be wondered at when we remember that in the early part of the last century the treadmill operated by horses, oxen, dogs, convicts and slaves was not an uncommon method of securing needed power.

While the expansive force of gunpowder was early recognized as a possible source of power and was probably tried before any modern application

of steam and has been tried many times since even as late as 1891, it is to steam that we are obliged to look for the first really successful self-propelled carriage. The difficulties connected with building and operating gas and hot-air engines, or their predecessor, the gunpowder engine, were not sufficiently well understood when the early attempts were made to permit their being overcome, while the inability to get suitable machine work for such engines and suitable lubrication made them practically out of the question. It was not that the thinkers of those days were unaware of the principles involved or of the possibilities, but that they were ahead of the age and therefore ahead of the market as well as ahead of the practical equipment needed to do the work. Some idea of the imperfection of machine tools may be gathered from the fact that Watt wrote a friend about his steam engine and explained that he had succeeded in getting the piston fitted to the cylinder so accurately he could not insert anything thicker than a half crown between them. Only a mechanic who has worked under such discouraging conditions can appreciate the joy that the pioneer of steam would have felt had he been able to secure work down to fractions of a thousandth of an inch in accuracy, as is quite practical to-day.

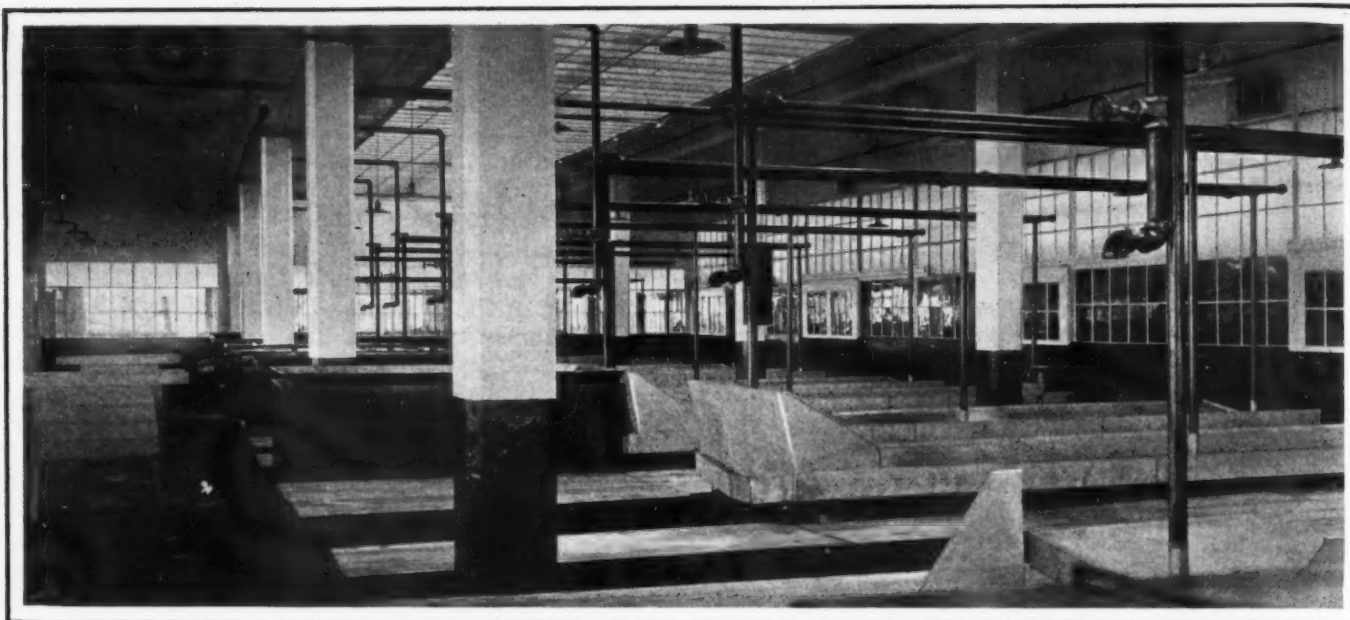
Piston Lapping Machine a Labor Saver for Hupmobile

The illustration shows a novel machine in the factory of the Hupp Motor Car Co., Detroit, Mich. It is called a piston lapper, and was designed by the concern. Four blocks of cylinders are placed on the machine at one time, two on either side. By a "walking beam" movement, the pistons attached to the machine are forced up and down in the newly machined cylinder blocks until a good lap fit is obtained.

At the same time as the up-and-down movement is being carried on, the pistons are made to revolve by gears at the top of the piston linkages. This is to insure a perfect lap fit.

By the use of this intricate-looking device, one man now does the work formerly done by eighteen men—an enormous saving of labor cost.





One of the two dipping rooms at the Buick plant where aprons, fenders, radiator shells, etc., are immersed in enamel by men in dust-absorbent clothes. The parts are then hung on racks to allow excess enamel to drip off. Hoods are dipped in a separate room at one end. Each of these rooms has a separate supply of washed air

Eliminating Dust in Body Enamelling

Buick Uses Washed Air, Rooms with Walls and Floors Oiled and Special Absorbent Clothing for Workmen—
Spraying, Dipping and Baking Avoid Delay in Production

By L. V. Spencer

THE body painting and metal parts enamelling departments are the bugbear of many an automobile manufacturer. Fine finish is one of the things that helps to sell cars these days, yet it is a costly feature to obtain, and it takes time to produce it. Dust is its deadly enemy; it frowns seriously upon rapid production insofar as this branch of the work is concerned.

For there are probably no parts of the average plant that take up more room, are conducive of more waste and hold onto the car longer in its journey to completion than those divisions which have to do with these color processes. Though rapid production kinks are constantly being installed in other departments of the average plant, little thought is given to methods of speeding up the painting operations without in any way sacrificing the desirable fine finish. Methods which have been in vogue since the carriage days are still adhered to in most painting rooms, with the result that while production is speeded up at a great rate in all other departments, there is a marked slowing down again when the car reaches the "paint." Hand work is usually employed, with the time-honored paint brush monarch of all it surveys.

Paint Usually Slows Production

Several of the big makers, however, have been studying this matter of painting, and have realized that they could get the cars out faster with some modern methods of quickening the processes. The main operations in painting and enamelling are to apply the paints or varnishes and then to dry them. So the production men have studied the problem,

and now in many plants where the output runs into thousands of cars a year, both of these operations have been hurried. Application of the colors is done in many cases by either dipping the parts into them or by spraying them, and drying is hastened by huge ovens.

New Methods for Parts

While this development in painting and enamelling does not apply to the bodies of cars to any great extent, many large producers employ the new methods in enamelling the metal parts. No doubt the spraying and baking scheme will be extensively extended to body finishing as time goes on, and facilities for uniformly and smoothly applying the coats in this way to such large and unwieldy surfaces are perfected.

Typical of the very latest in the new era of enamelling and painting plants is the building belonging to the Buick Motor Co., Flint, Mich., especially for the enamelling of metal parts and the spraying of varnish onto wheels. The utmost rapidity of applying the coats to the parts is made possible, and huge baking ovens do the work of quickly drying these coats. No loss of time is occasioned by the new department, the capacity of which is every bit as great as any other part of the big factory.

All chassis metal parts, such as fender irons, hoods, fenders, radiator shells, and the like receive lasting coats of enamel here, and the pains taken to assure a smooth and lustrous finish are almost unbelievable. Dust is recognized as the enemy of the whole process, and the means employed for

eliminating that microbe from the varnish and enamel surfaces is most elaborate.

Color Sprayed on Wheels

There are also some new ideas worked out in the coloring of the wheels by spraying, then baking them in ovens similar to the enamelling ovens. A surprising saving of time is the result of this wheel painting method, for it takes considerable time to properly coat each spoke with a hand brush.

The new Buick enamelling building is three stories high and measures 110 ft. wide by 260 ft. long, giving a total floor-space of 85,000 sq. ft. The arrangement of the floors is given in the floor plans herewith. Throughout, the new building has been laid out for a production of 350 cars a day. This does not mean that only 350 wheels can be colored in a day, but that enough for that many machines can be put through—1400 wheels. This applies to fenders and other parts as well. Each car has four fenders, so the fender capacity is 1400 per day, and so on.

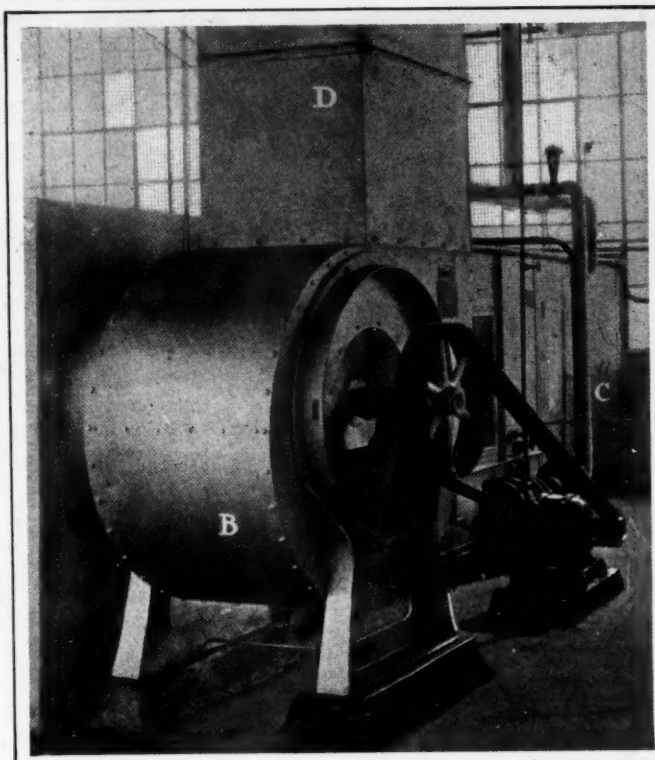
The Pickling Room

Coming from the manufacturing departments, some of the parts to be enamelled are first taken to the second floor. Here there is a pickling room measuring 35 by 70 ft., where the metal parts that have smooth flat surfaces, such as fenders, aprons and hoods must have an acid bath before they can go upstairs to the beauty parlors to be enamelled. Rust, finger marks and other foreign substances must be entirely eliminated from the surfaces of these parts before the enamel can be put on. Should a finger mark be left on the surface of a fender, for instance, the enamel would come off at that spot in less than three months. The same with rust and other substances. For the enamel to stay on, it must be applied to an absolutely dry and clean metal surface.

However, this pickling room visit is not required of the rougher metal parts such as step hangers, tire irons, bolts, and the like. The enamel has plenty of opportunity to stick to them providing they are wiped clean. These go directly to the enamelling department.

In the pickling room there are six vats each large enough to receive a fender or an apron, and above them, as protection to the workmen, are hoods which carry away the fumes. The first two vats contain a strong acid solution, the second pair have a weaker acid, and the others contain hot water only.

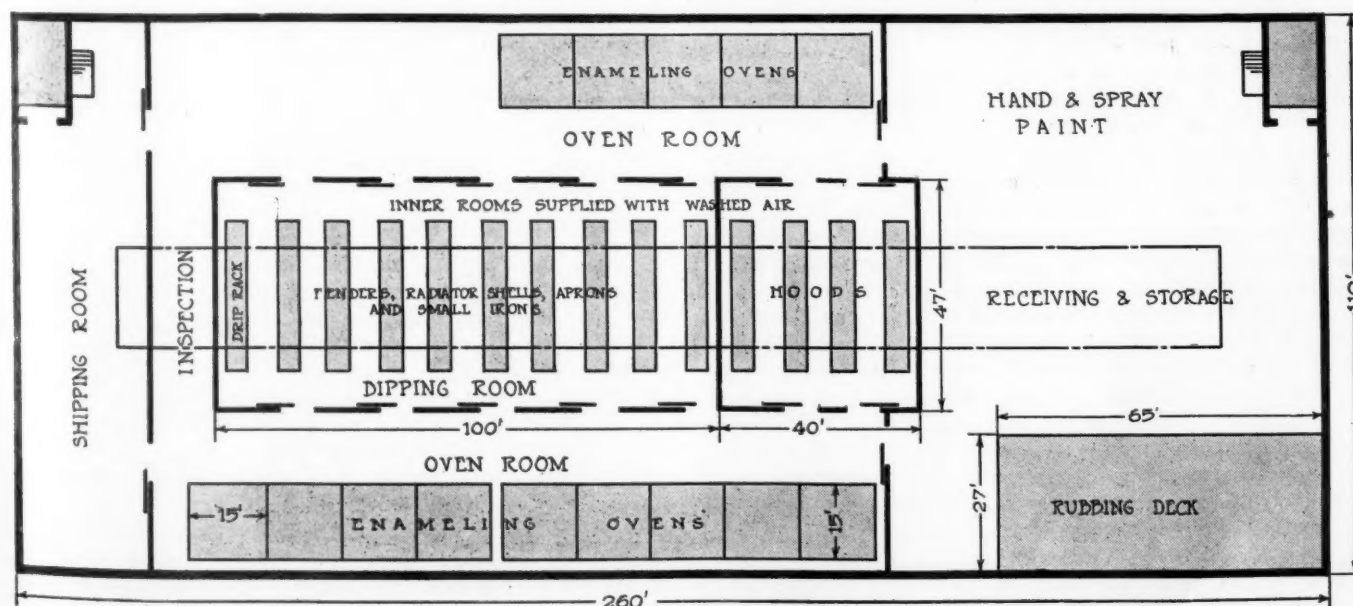
The procedure is to first dip the part in the strong bath,



The large blower-type fan B which draws the air over a series of baffles, thus washing it. D is the air shaft and C is one of the pipes which carry the purified air to the inner rooms

then to transfer it to the weaker bath, after which the acid is rinsed off in the hot water. The piece is left in these acids only from 15 to 30 sec., and it is a solution which quickly eats off any rust. Following the baths, the piece is dried by directing a jet of compressed air onto it to get any acid out of the cracks, in addition to which a man rubs it with special cloths, always being careful not to put his fingers on the clean surface. The piece is now thoroughly cleaned and is ready to go to the next floor for the enamelling processes.

Here the campaign against the dust microbe begins in earnest. The actual dipping of the parts is done in two special rooms, which are virtually rooms within the main rooms. That is, they have four walls and ceilings, and are thus com-



The inner rooms of the enamelling department are shut off from the rest of the floor where the ovens for baking are located and where the hand and spray painting, rubbing, inspection and shipping are done



One of the banks of huge ovens used for baking the enamel on the sheet metal parts after they have had been dipped and drained. There are fourteen of these ovens

pletely inclosed within the main boundaries of the floor. Air which has been washed by a special process is circulated through these inner rooms, so that the purest of atmosphere is obtained.

Oiled Walls and Floors Kill Dust

But this is not all. It would be an easy matter for dust to reach the enamelled surfaces if the floors were not specially cared for. So, to further prevent dust, the walls and floors of these inside rooms are oiled. Once a week they are mopped in paraffin oil. Any slight amount of dust that might get in is thus caught by these surfaces and kept out of the air. But, you say, the men themselves might bring in some dust on their clothes. Buick has taken care of even this slight possible dust agency by requiring the enamellers to wear specially-prepared clothing, which absorbs any dust against its recirculation in the air. These clothes are furnished by the company at cost to the men.

Only black enamelling is done, and before it can be put into the dipping tanks, the enamel is first clarified and then mixed with oil to give it the right specific gravity, or thickness. The apparatus for clarifying somewhat resembles a cream separator. The centrifugal action of the apparatus throws off any impurities in the liquid. The clarifying is done to insure that only the clearest possible enamel is used. Having been properly mixed, the liquid is pumped to an overhead tank through the clarifier, and it then is strained back into a storage tank through a series of special gauze sheets ready to be drawn off into the dipping vats.

Arriving through pipes at these vats, the enamel is again strained through gauze before actually running into them, doing away with any foreign matter, however slight, that might have been collected in the pipes or connections.

Washed Air for Inside Room

The method of obtaining the washed air for these inside rooms is the same as that employed in theaters and other

public places where they make a great feature of the washed air which their patrons breathe. For the dust pest is just as detrimental to an enamelled surface as it is to the lungs of the human being. The air is drawn by the suction of a large blower-type fan from outside through a series of baffles over which water is constantly playing. This literally washes the air, and the dust is trapped at the bottom of the air box. Reaching the blower after coming from its bath, the air is then sent through galvanized piping to the inner rooms. Ventilators are located near the floor, so that the air is kept circulating, since it is introduced to these rooms at the ceiling.

Separate Air Supplies

The two dipping rooms, which are thus proof against dust, are separated from one another by a partition, and each has its own supply of air. One room, in which hoods are dipped exclusively, has five dipping tanks, while the other adjoining room is provided with ten tanks and is used for aprons, fenders and radiator shells, principally.

Fourteen Baking Ovens

Along the length of the floor and outside of the dipping rooms are arranged the series of baking ovens, fourteen in number. Nine are placed on one side and five on the other for convenience. The floor plans show this arrangement clearly. Sliding doors in the sides of the dipping rooms allow the placing of the enamelled pieces in the ovens conveniently. These doors are of necessity kept closed at all times except when an actual transfer from dipping tank to oven is being made, for otherwise, the very purpose of the inner room would be defeated. It would never do for the air of the outside main room to get too well acquainted with the pure air of the inner room.

The dipping process is simple. We have seen how the parts are washed in acid and dried. Just before entering the inner room they go through one more procedure. They are

wiped with special dust-collecting rags, known as "tacky" rags. After all of this initiation, they are given the password to the inner shrine.

Dipping Hoods and Fenders

Two men do the dipping, one standing on either side of the tank. They use long hooks to catch hold of the hood or fender, drop it slowly into the tank of enamel, and then hang it over a drip pan at the end of the tank. It remains here for about 10 min., after which it is placed in the oven for 1½ hr., and baked at a temperature varying from 400 to 450 deg. Fahr.

Special racks are provided over the drip pans to accommodate the dripping pieces coming from the tanks, and the excess of enamel thus dripping off is drained back into the tanks. As many as forty fenders can be accommodated on one rack.

This first coat is known as the No. 1 "rubber coat," and following its baking on, the part comes back into the dipping room for the No. 2 rubber coat. The same dipping procedure is followed, after which another 1½ hr. baking is given it. Then a third or finishing coat is applied in the same way, and the piece goes into the oven for the last time, consuming another 1½ hr. Allowing 10 min. for each dripping, the actual time required to enamel a piece is 5 hr., figuring from the time the first dipping takes place to its final removal from the oven.

Special portable racks are used to hold the pieces while being baked and to convey them to the outgoing end of the floor after their final baking. These are specially shaped to receive either fenders, hoods or whatever other part is enamelled.

The ovens are a standard type made by Young Bros., Detroit, and designed to be heated by gas. They are constructed of sheet iron, and have provision for taking off fumes incident to the drying. They are about 15 ft. square and arranged to maintain the temperature desired.

Occasionally a fender or apron is marred or scratched in the assembly or in the course of painting, and to take care of any such, a rubbing deck is provided on the enamelling floor. This deck is about 20 by 60 ft. in size and provides for the preparing of the damaged piece for re-enamelling. The men smooth off the scratched places, and follow the usual procedure of making a piece ready for painting.

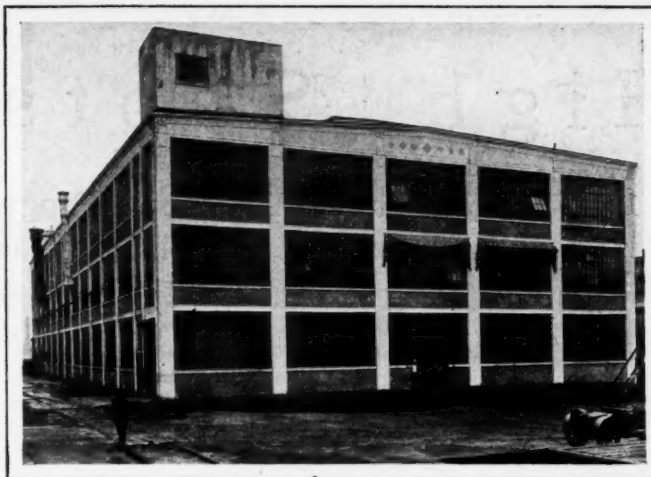
Baking the Wheels

No less interesting is the method of coloring the wheels on the floor below. Arranged around three sides of the wheel painting room are fifteen specially constructed ovens for the baking of the wheels. The room is approximately 80 by 100 ft. in size, and the ovens measure 10 by 10 ft. In the center of the room are the eight spray stands, each within a hood which carries away the fumes and gases, and confines the spray to the hood space. Each hood is about 3 ft. wide by about 4 ft. in height, giving plenty of room for the wheel, there being a dummy spindle on a stand to receive the wheel to be sprayed.

At the bottom of the hood there is a trap which catches the excess of the enamel, saving it for use again. The hoods connect through piping with a suction blower which carries away the odors, and also draws along some of the sprayed enamel suspended in the air. This is caught at the blower on a series of baffles and reclaimed.

Ovens for Wood Parts

The ovens are not like those used for metal enamelling, since they are not subjected to such high temperatures—130 to 140 deg. is about the average limit, due to the glue and sap in the wood wheels. Made of wood, the ovens are lined inside with galvanized iron, with a coating of asbestos between this and the wood. They are heated by steam, and



The new Buick enamelling building is three stories in height and 110 by 260 ft., giving a total floor space of 85,000 sq. ft.

the permissible temperature is 250 deg., although this is but rarely reached.

Another series of hoods are also a part of the wheel painting equipment. These have to do with the sanding of the wheels and are twenty in number. The natural wood is first given a lead coat by hand, and before any of the color varnish is sprayed on, this lead coat must be rubbed down to a very smooth surface. This is done by hand with sandpaper, and has always been regarded as a dangerous occupation, for the sander is apt to breathe the tiny particles of poisonous lead as he rubs the spokes, getting them into his lungs.

The New, Safe Way

The hoods now used by Buick do away with this danger, for the suction draws away the dust, the sanding being done within the hoods specially provided for that purpose. Then follow the oil and primer coats, after which the color varnish is sprayed on.

The wheels come to the sprayer on double deck racks. Behind his hood he has two of these racks, one loaded with wheels ready for spraying and the other empty. He places the finished wheels on the empty rack, which, when loaded, is pushed into the oven. This spraying method is a remarkable time saver, for it requires but 40 sec. to finish a wheel. At the same time, the spray gets the paint into the pores of the wood and the isolated cracks in much better fashion than could be done by the slower hand process.

The wheels are baked for 1 hr. and 10 min. at the 140 deg. temperature, and they are then given their final varnish coat in the same way, another baking completing the job.

One Man Replaces Ten in Oldsmobile Wheel Department

New methods have been introduced into the Oldsmobile plant in the wheel finishing department and it is estimated by officials of the company that one man now does the work of ten in this phase of Oldsmobile manufacture. In former times, the finishing fluids were put on the wheels with a brush and a large body of workmen were required to carry out this work. Methods in this branch of automobile production have now become simplified and instead of the old brush painting method, the wheels in the Oldsmobile plant are finished by dipping them and then spinning them on a spindle revolving at high speed. By this method, the centrifugal force applies the finishing fluid much more evenly than would be possible with a brush and furthermore, one man can accomplish the work done by from ten to a dozen with the slower methods. The whole process of dipping and spinning a wheel requires not more than a few seconds.

High Spots in Design

1916 Models Show All-Round Progress—Multi-cylinder Motors, Reduced Weights, Simplified Chassis and Higher Efficiency

By A. Ludlow Clayden

IN succeeding issues of THE AUTOMOBILE, progress in the design and manufacture of different component parts of 1916 cars will be described in detail. In the following it is desired to touch merely upon the high spots; to review the situation in a very broad and general way. The broad view, if it is less instructive, serves to give a better perspective than is obtainable from a more detailed study; it is an almost essential preliminary to the latter.

Hardly ever before in the history of the automobile industry has there been a year so full of mechanical progress. Often in reviewing a year from the mechanical aspect it has been difficult to pick out the most important trend; has been a matter for debate whether the changes had been greatly for the better or not. During 1915, however, there is nothing to create doubt, though, of course, there may be discussion as to which of the different developments is destined to rank highest in ultimate importance.

V Engines Most Spectacular Novelty

Of course, the twelve-cylinder engine stands out as the most striking development with the coming into general popularity of eights as the second surprise. The eight has consolidated itself in a way that its most sanguine supporters would hardly have dared to predict a year ago, and the twelve has been accepted very quietly, as a natural development of the V-engine principle. It was just as bound to follow the eight as the six was bound to follow the four. Taking a long view over the engineering argument of the year on this subject of multi-cylinder engines, the conclusion has been reached that both varieties of V motor are good engines. The point remaining in doubt is the exact, best application of eights and twelves to automobile use.

The subject is intimately bound up with the question of weight. Till lately it has been assumed tacitly that the luxurious, seven-passenger car must necessarily be of a weight in excess of 4000 lb. With this as a basis the purpose of the twelve is easy to explain, but when it is shown that 1000 lb. or more can be cut from this weight, without affecting any quality of service, the position of the six is improved. Weight reduction is but just beginning and it is not yet possible to predict how little the ultimate automobile will scale. Till this knowledge is obtained it would be folly to attempt to place the future of different types of motor.

Small Twelves Coming

Next year we may expect to see twelves and eights with small total piston displacement and to thus have evidence for estimating where the advantages begin and end. One school of engineering holds that there is no need for any motor with more than six cylinders unless of a total capacity exceeding 400 cu. in., while another predicts a general use of twelves down to half this size.

American engineering in the automobile field can congratulate itself most heartily on the wonderful success of V motors. To create a type that is really new, and to make it in all qualities and for all prices, and to satisfy the public with each and every variety is no small accomplishment for a single, short year.

Perhaps the success of the V motor is all the more remark-

able because in making new designs the engineers have, at one sweep, modernized everything. Crankshaft speeds have been raised, valve proportions increased, compressions altered and new lubrication systems adopted. In a broad way all these things have gone through without trouble above the trouble inseparable from new model production; the great changes have been no more difficult than the smaller ones of previous years.

The increase in motor efficiency is also partly due to the fact that much experiment has been made since 1912 with a variety of things that have all been brought to perfection simultaneously. The aluminum piston has been tried out here and there for many years and in 1915 it has come into its own. The various improved lubrication systems have similarly developed in experimental shops and all come into regular use suddenly. Engineers who had been studying cam design and rapid valve action for long, found the opportunity for the complete redesign they had been wanting. And so with many petty details, everything has been done at once, in a manner of speaking.

Carbureters a Large Factor

To the credit of the V motor must go a great change in the average excellence of carburetion, for the even torque of the eight and twelve have made possible, and desirable, crankshaft speeds far below anything attempted previously except on a few very costly sixes. This demand for good gas at ultra low revolutions, combined with good gas at crankshaft speeds far above previous practice, has led to many changes of detail in carbureters which all tend to make an already accurate instrument still more precise.

With the earlier eights it was found that the only way to get the desired "ability" was to use a mixture wastefully rich, and this dirtied the cylinders as well as costing much in gasoline. Now by perfecting the air and fluid mixing devices, by making valves move more positively, or by reconstructing nozzles, we are getting better ability with greater economy. Development along this line is certainly not yet at an end, but the advances made are much greater than appear on the surface.

What of Aluminum?

It is interesting, if idle, to speculate on what might have been the state of design had aluminum fallen in price instead of rising. The now almost "precious" metal ought to sell for a price not exceeding double that of casting iron, weight for weight, and it will do so one day when there is a sufficiency of plants for its production. Meanwhile its use in large quantities is confined to cars of moderate and high price. It may be that the aluminum cylinder motor will in the future come to be seen as the most important development of 1915. It may outshadow the multi-cylinder engines and everything else.

At present all that can be said is that there are many motors with aluminum cylinders that are giving the greatest satisfaction in use. That these motors are much lighter than the ordinary, cost no more to machine and assemble and are easier to cool efficiently.

Conversely, we desire experience to show whether the

metal will withstand long use, year after year, and whether the price will fall sufficiently to make wider use of aluminum commercially possible. Also there is the possibility that the lightness obtainable with aluminum may provoke other experimenters to devise ways for using sheet steel which will give equal strength and satisfaction with equal lightness. At present, light metal seems the easiest and best way of obtaining light chassis.

Light Weight Spells Low Cost

The ratio of the cost of the metal in an automobile to the labor has changed and the cost of producing a car complete can be gaged in a rough way by its weight, if the standard of engineering is about the same. Thus refined design which enables weight to be cut, assists the manufacturer just as much as it helps the man who has to pay the gasoline and tire bills.

The present year has seen the beginning of light weight work on the part of engineers generally. There have been some who have realized its advantages for years, and built light weight cars, but it is only lately that the attention of the majority has been attracted to this most vital problem.

Spiral Bevel Generalized

Hand in hand with higher efficiency motors, running at higher speeds we see the spiral bevel gear for rear axle transmission has come into general use. Last year it was employed on many chassis, but it was confined mainly to machines of high price. Lower gear ratios to give greater high gear ability are now the rule, and it is difficult to find room in an axle case of reasonable size for straight tooth bevel gears with a ratio much below 4 to 1. With the spiral bevel, however, the task is easy.

Another reason for the popularity of the spiral form of gear is that it is naturally quiet in operation. This was known years ago, but that the new gear was as durable as the straight tooth form had to be proved and was proved by the 1915 model cars. Thus on the 1916 machines the spiral bevel is used almost always, except where cost is an extremely important consideration.

Even then the position is rendered difficult of judgment, because the number of spiral bevel gears asked for by automobile manufacturers has exceeded the possible output. The machine which made the spiral bevel a commercial possibility is new and its makers have only been able to supply a proportion of those they have on order. This being the case the spiral bevel ought to be cheaper next year and to come into wider use than ever.

Gearing Changes Little

In gearset and rear axle design but few innovations have been made. Probably the most striking development is the discontinuance of the rear axle location for the gearset by the Packard Company, who have been the leading exponents of this design for so many years. Generally, the use of the unit transmission is declining, mainly because the unit power plant is a better proposition from a manufacturing viewpoint. It is possible to see a slight trend toward the use of double internal brakes on the rear axle, but the point is debatable, because axle manufacture is confined mainly to a very small number of firms, and these have been far too pressed by unprecedented business to consider changes of design even of the slightest.

One development which was expected by some people and has not transpired, is the electrically operated gearshift, another is complete electric transmission. With respect to the latter, however, it must not be forgotten that the Owen Magnetic car has been far more successful commercially and practically than most of the trade anticipated, and it is to be supposed that this will not be without effect upon engineering thought in general. The placing on the market, and selling in regular, if small, production of a passenger car with

an all-electric transmission deserves a prominent place, however, in any list of mechanical achievements of the year.

Better and Cheaper Materials

Thanks largely to the accumulated labors of the S. A. E. Steel Standards Division, the average of quality of fairly good steel has been raised quite perceptibly, because the creation of standard specifications has assisted steel makers to discover better methods. It has been possible to tighten the limits of accuracy for chemical constitution of many steels, and users find that a more regular quality is coming to them, without an increase in price. This has had a levelling effect because it has helped to offset the slight general rise in the price of cheap steel due to the huge demand for purposes other than automobile making.

Chassis Layout Simplified

As was pointed out in a recent article, the reduction in the price of automobiles has largely been due to a simplification of detail and the elimination of parts which have proved needlessly cumbersome or altogether valueless. For instance, brake rod layouts have often been redesigned so as to eliminate a number of brackets and links. Likewise the pedals and steering gear now commonly make up with the power plant instead of being separate frame attachments.

More important still, in the detail of the detail simplification has been the rule. Stampings and pressings have replaced castings to a much larger degree than formerly. Die casting is becoming more popular for all sorts of small parts. Block motors eliminate the necessity for pipes and couplings. Perhaps this tendency is most conspicuous among accessories and fittings. Lamps, switches, control details and such like, are now more often die castings or stampings than anything else, yet a short time ago heavy, expensive brass castings found a large use in their makeup.

Battery Ignition Gaining

It would be a nice point to decide how much price has influenced the ignition situation, and equally delicate to forecast the future of ignition mechanically. Whatever opinions may be held, however, the fact remains that battery ignition has gained in favor enormously. It has improved too, being vastly better in detail than a few years ago. Makers of distributors and contact breakers have taken a leaf from the magneto manufacturers' book and utilized similar materials with similar care and accuracy, so the reliability of battery ignition now rests mainly upon the battery and the generator which keeps it charged.

Batteries themselves are improved a little in mechanical detail and generators in both electrical and mechanical efficiency, so the battery ignition that has come through this season without mishap stands an even better chance next year. None the less the magneto has not stood still and remains the standard ignition where performance is considered above everything else, with one or two exceptions.

Bodies Are Larger

Bodies generally are larger, of better appearance and more comfortable. On the matter of size it is possible that manufacturers have gone a trifle too far, because many of the seven-passenger cars of 1916 type are not good to ride in with less than five passengers aboard. Four people are usually much better suited by a close coupled design and not too great a width of seat, and the rapidly growing popularity of clover leaf three seaters, small four-passenger jobs and roadsters with a single seat wide enough for three, shows clearly that whatever the majority demand may be for, there is a large class that prefers a less spacious body.

Parlor car front and sometimes rear, seats are another development of the year and at present look as though their popularity would lead to a wider use of the design next season.

German Army Transport

Heavy Consumption of Automobiles and Trucks Points to Shortage After War—Large Field for American Products

By E. A. Langdon

HANOVER, GERMANY, Aug. 30—There were some 70,000 motor vehicles, including passenger cars and trucks, in Germany when the war broke out; to-day there are fewer than 15,000. In the Dual Monarchy, Germany's ally State, there were more than 30,000; to-day there are considerably fewer than 10,000; in other words, the civilian population has lost the services of some 75,000 motor vehicles in Germany and Austria-Hungary. These vehicles are now rendering yeoman service in the campaigns in the east and west and were largely responsible, it is said, for the rapid advance of the Germans in France during the first three weeks of the war in 1914, as well as for the manner in which the German army in Poland stemmed the Russian tide and severely defeated the Czar's hosts a number of times.

It would be going too far into details to consider here the thousand and one ways in which the transportation system has rendered the Kaiser's army as efficient as it has. But from the descriptions of the several special newspaper correspondents, who have been permitted to visit the front, and from the tales of wounded soldiers who have been sent to the interior of Germany, it is obvious that the importance of the motor car to Germany to-day is on a par with that of the other two classes of military equipment, which have revolutionized modern warfare; namely, heavy rapid-firing artillery and aerial scouting service.

In addition to facilitating the transports of troops and materials of all kinds, the motor car has done invaluable work for the "Sanitaetswesen," hospital division, and has taken over a great deal of the work formerly exclusively handled by the cavalry; namely, reconnoitering and carrying of rapid dispatches.

Car Supply Maintained

In addition to the approximately 75,000 motor cars taken into German and Austrian army service at the beginning of the war, many thousands of vehicles have been turned out by the car factories of both countries. Many plants are working seven days a week and twenty-four hours a day, and in not a few cases have the vehicle designs and the production machinery been adapted to the specific requirements of the strenuous army service. It will probably take a long time ere the details of this wonderful adapting process, planned and carried out even while the armies were battling on the borders of the Empire, will become generally known. The effect of this system, however, is that the number of motor vehicles now in service is even greater than that available at the outbreak of the war; for not only have the factories worked at maximum capacity, but thousands and thousands of owners whose cars were not requisitioned by the government have put and are still putting their vehicles at the disposal of the fatherland; in many cases they also serve as volunteer drivers if they were not called into the army already.

Of course, a great many vehicles are destroyed or damaged, due to the terribly hard work. The remainders of the former are taken to the interior of the country, to be refashioned and reused as best they may, while the injured cars and trucks are taken to the nearest "Automobillazarett," automobile hospital, to undergo quick but thorough repairs. It is

almost impossible to learn the details of these elaborate repair works, five of which are said to exist along the western front and four along the eastern; the Austrians also have one automobile hospital in the east of Galicia, near Cracow. In these places the work is also carried on incessantly.

Like everything else in war, the motor car equipment is being worked at maximum capacity. If the cars are used for troop transports, a touring car designed for five or seven passengers is frequently made to accommodate twenty soldiers. The effect on motor, running gear, etc., especially the spring suspension, is obvious enough. But if there is any way at all in which 25,000 cars can be made to quickly carry 500,000 fighters from one point of the front to another—often 100 or 200 miles away—the expense of the process must necessarily be ignored. Thanks to the fact that

"—beyond a doubt,

A chaise breaks down, but doesn't wear out—"

one part of the car after the other may be injured and repaired and the whole vehicle still remain useable.

New Factories Created

Another fact which is positive enough, although it is very difficult to obtain detailed information about it, is that many machinery factories, the products of which are not needed or not badly needed while the war goes on, have been transformed into automobile or parts factories. This still enhances the supply of available motor vehicles.

Thus, there seems a foundation for the assumption of the German military motor experts that the Kaiser will have all the cars and trucks he needs, even if the war should go on for years.

It should be remembered, however, that what is fair in war is not always considered so in times of peace. After the conclusion of the peace the owners who have willingly sacrificed their machines on the altar of the fatherland will undoubtedly make wry faces when their cars are returned to them. Every machine will be badly battered and shaken through and practically unfit for pleasure use. The trucks, too, will have suffered to such an extent that their operation will be much more expensive than before, due to ever recurring high repair bills and high fuel consumption. A few weeks after the war it will dawn on nine out of every ten owners that the best course for them to take is to buy new vehicles.

From where are these vehicles to come?

Shortage with Peace

The German factories' capacity will be far short of being able to supply the demand. There will be a call for from 50,000 to 80,000 new motor cars and trucks in Germany, and perhaps 25,000 in Austria-Hungary; as not only will the cars destroyed and spoiled by the war have to be replaced, but tens of thousands, perhaps hundreds of thousands of horses killed during the war will have to be supplanted by motor vehicles. The prediction made by many experts during the early days of the war that the war will serve to motorize Europe will come true.

German factories will of course attempt to supply the de-

mand as far as possible, but will be hampered both by a shortage of labor and by a lack of capital. The shrewd German manufacturers will undoubtedly reason that it is not good business policy to increase their factory equipments to a very great extent for the immediate supply of the great demand, only to be a year later with superfluous equipment or superfluous stock which could not be sold profitably on the world's market. Furthermore, the scarcity of money will in itself be a hindrance to a general increase of capitalization.

Hence, Germany will look to other countries to supply at least part of her great motor car demand.

It is safe to say that Germans will buy as little as possible in the way of English and French-made goods. Probably Switzerland will therefore supply many high-priced cars to Germany. In addition, the Belgian industry may find a German market depending on the friendliness of the relations of these two countries after the war.

For, there will enter more sentiment into business matters after this war than ever before. The commercial relations between the now belligerent countries will be mended much later than the political ones, and in this fact lies the great advantage of the nations which remain neutral through the full time of the conflict.

For this reason, and also because of its ability to produce standard, efficient, moderately-priced passenger and commercial cars, the United States should be in a position to sell myriads of cars to German buyers. This, however, will not be as simple and as easy as might appear at first glance, for reasons which will be given a little later on.

America's Opportunity

Standard American products, sold intelligently by American methods and at American prices, have long since found a good market in Germany as well as in Austria-Hungary. All kinds of machinery, including machine tools, typewriters, phonographs, motor cars and motorcycles have been welcomed by the Germans if introduced in the proper manner. Especially is this true of motor vehicles, for the number of motor cars per head of the German population is from one-tenth to one-eighth of that in the United States, although the economic power of the average German is certainly not less than half of the average American. The difficulties consist in the slow and careful thinking of the Germans, who give much thought to such a matter as the purchase of a car or truck before they spend the money. A car must be so designed, in-

ternally and externally, as to be suitable for four to five years' use. Simplicity of design and color, strength of construction and relatively low fuel consumption are wanted by German buyers. Service is another important point. Not one German buyer in ten will purchase a car unless it is backed by years of satisfactory performance and unless the company keeps a stock of spare parts within a few hundred miles of his place of abode.

Despite these difficulties, a number of well-known, standard, well-equipped, medium-priced American makes have been successfully introduced into Germany and Austria-Hungary. As the foregoing explanations indicate, selling in these countries is not as easy as in America; but, nevertheless, splendid business has been done by the efficient selling organizations of these concerns.

There is another difficulty about this situation, which has been brought out, in fact, created by the war, and which will continue to be effective for a considerable length of time after the cessation of hostilities. It might as well be admitted that there is a widely felt lack of sympathy for America in the realm of the Kaiser. The reason is simple. Germans do not realize the geographic, commercial and political position of America very well, and there is a widely prevalent idea that Germany had deserved a more friendly treatment from America than it got since the beginning of the war. This feeling may be poorly founded, but its existence is an indisputable fact. Hence, the American is not looked upon with the same amity to-day as he was a year ago. The fact that English is the only language spoken by a great many Americans hardly helps to alleviate the situation; it rather has the opposite effect.

Salesmen Must Speak German

This fact has the following bearing on the commercial situation. The average German, after the war, will be loath to deal with a salesman who does not know the native language. It is to be presumed, in fact, that a salesman not in command of German will be at a very great disadvantage. Even a foreign accent will be looked upon in the nature of something unfriendly to Germany—of course, only by the little business man; but these people, after all, constitute the largest class of prospectives in Germany. Therefore, companies starting an export campaign in Germany after this war should be careful to equip their salesmen with a knowledge of German; in Hungary and Bohemia, the languages of these countries should be known by the salesmen.



W. H. Durborough and Irving G. Reese in the Stutz car which they used for seven months in covering the European war for the Newspaper Enterprise Association. The car was shipped to Rotterdam whence the two correspondents drove to Berlin and followed the German army into Warsaw. They chained the car to a tree in Russian Poland for seven weeks while they went in a military car to see a battle.

It hardly needs to be mentioned that, selling being less simple than at home, the salesmen will require some diplomatic ability to do business.

Among the many developments brought about by the war is also the following one, in the fuel situation. It is an admitted fact that Germany, on account of a shortage of gasoline, has taken resort to benzol and alcohol. Most probably, the fields of these fuels will increase after the war, and many thousands of German car owners will insist on using benzol, for economical and patriotic reasons. Alcohol, too, can be very easily and cheaply produced in Germany, as this country is the leading potato grower of the world. Hence, it would pay for American manufacturers to experiment with adaptations of their motors to these two fuels. The very argument that benzol or alcohol can be used in a car will enable its salesman to get a better price for it than he could if the machine needed gasoline for its operation.

Government initiative in Germany and Austria has grown very strongly during the war, and very probably will continue to do so after. It is safe to assume that the governments will do their best to further the home industries producing these two fuels and that the population will follow their lead with enthusiasm. This renders the point of a motor applicable to non-gasoline fuels of eminent importance.

Tire Market Temporary

Tires will probably find a very ready but short-lived market after the war. If American makers will be able to supply large quantities at most reasonable prices, they will be

able to do a great volume of business in a very short time. It is reasonable, however, to assume that the artificial rubber question is also being solved, as so many other problems, under the pressure of the war. If this is the case—and indications seem to point in this direction—then Germany will very soon produce enough cheap synthetic rubber to supply its entire demand for tires.

Several classes of accessories, such as starters, lighting equipments, automatic tire pumps, etc., should also find a good market, provided the products are reliable, simple and reasonably priced.

American motor car manufacturers who are not represented in Central Europe at this time and intend to break into the German and Austrian markets after the war, would do well to send one or two intelligent representatives to these territories without delay. These men could gather valuable information about conditions in general, about the experiences with the different types of vehicles in the war zones, about the sentiment of the people; they could outline a sales campaign to be carried out after the war; they could form valuable business connections, etc. As already stated, it is highly important that these men be possessed of practical intelligence and a strong instinct of how to act and what to do.

One thing is certain. American car manufacturers will have an unprecedented opportunity in Germany and Austria-Hungary after the war. The advantages of the opportunity will go to those who are able to see its magnitude now and who prepare for its utilization, so that when the right moment comes, the business may be carried through efficiently.

Three Models in Partin-Palmer Line

FOR 1916 the Partin-Palmer line, built by the Commonwealth Motors Co., Chicago, Ill., will consist of a light five-passenger touring car known as the model 32 and listing at \$675, fully equipped, a six-passenger at \$975 and a roadster for \$495. The power plant consists of a four-cylinder motor $3\frac{1}{2}$ in. by 5 in. and has a three-point suspension. The cylinders are block cast with spacious water-jackets the water inlet being located in the center of the cylinder block opposite the valves and at the bottom of the jacket, permitting a complete drainage through the radiator. The cylinder head is cast separately, allowing ample space for valves and enabling proper setting of cores and even thickness of walls, designed to give greater efficiency to the cooling system.

The crankcase is of reinforced aluminum cast in two sections and completely incloses the flywheel and multiple disk clutch. Heavy webs are provided for supporting the crankshaft bearings with provision made for removing the bearing caps easily. An oil pan having a capacity of 5 qt. is bolted to the bottom of the crankcase. Any of the connecting-rods and pistons may be removed without disturbing the adjustment of the main bearings. Lubrication is by constant level splash, the level being maintained by a plunger pump driven by an eccentric on the camshaft. Cooling is by thermo-syphon.

Crankshaft bearings measure $3\frac{1}{4}$ by $1\frac{1}{4}$ in. front, and 3 15-16 by $1\frac{1}{4}$ in. rear; the flange to which the flywheel is bolted is integral with the crankshaft and the connecting-rod bearings are of the split type measuring 2 $\frac{3}{4}$ in. by $1\frac{1}{4}$ in. The camshaft is 1 in. diameter with cams integral, and is supported by three bearings. The valves are $1\frac{1}{8}$ in. in diameter fitted with gray iron heads and steel stems.

The three-speed gearset is placed in a unit with the motor, the gears and shafts being of liberal size, while annular ball bearings are used throughout. Drive is taken through a $1\frac{1}{4}$ in. shaft completely inclosed in a torque tube supported at the forward end by a yoke which is attached to the transmission housing instead of to a cross member of the

frame. A double universal is placed between the forward end of the propeller shaft and the transmission, while adjustable radius rods extend from the yoke to the rear axle.

The rear axle is floating with a gear ratio 4 to 1 and provision is made for adjustment of the differential without removing the rear plate from the housing. The driveshaft is fitted with New Departure ball bearings. Brakes are expanding, both emergency and service being fitted with equalizers. The rear springs are three-quarter elliptic underslung and the front semi-elliptic.

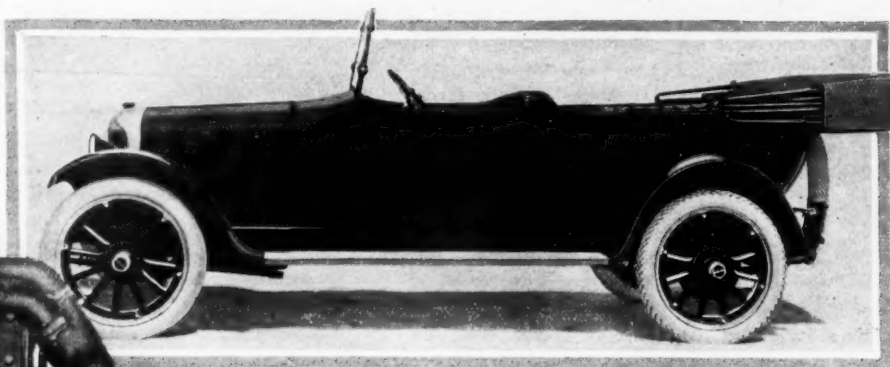
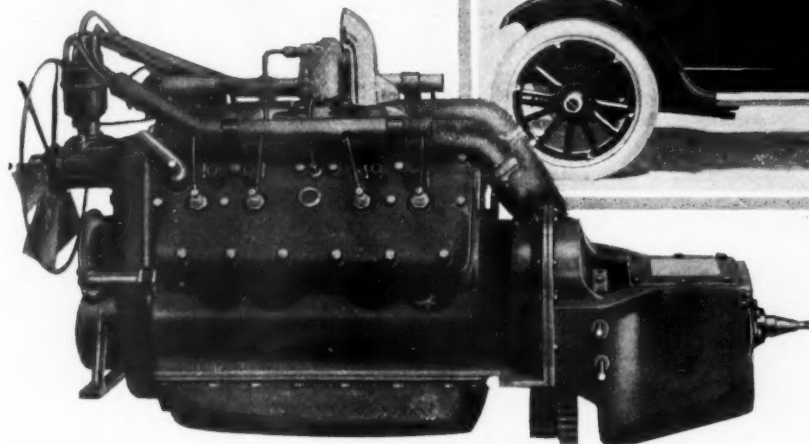
Body design follows yacht lines and the wheelbase of 110 in. affords ample seating capacity for three passengers in the rear seat, which is 50 in. wide. The gasoline tank, which is placed in the cowl, has a capacity of 10 gal. The body is finished in dark olive green and the fenders and hood in black enamel, while the wheels are red. Tires are 32 by $3\frac{1}{2}$ and the car is fitted with non-skids on the rear wheels. Equipment includes electric starting and lighting. Connecticut ignition, electric horn, Stewart-Warner speedometer, one extra rim with carrier, windshield and one-man top.



Partin-Palmer five-passenger touring car selling for \$675

Oakland Adds Eight-Cylinder Model

3½ by 4½ Cylinders Give
346.4 Cu. In. Displacement
—71 Hp. at 2600 R. P. M.



Above—The new Oakland eight-cylinder touring car which is built only as a seven-passenger type, the chassis having a wheelbase of 127 in. With complete equipment this car sells for \$1,585

Left—Eight-cylinder 3½ by 4½ in. motor used in the Oakland. This motor has a counterbalanced crankshaft made by forging crescent-shaped counterweights integral with the crank arms. Another feature is the use of aluminum pistons

ANOTHER of the prominent automobile manufacturers—the Oakland company—has fallen in line with an eight-cylinder machine, which is considered the best appearing car yet built by the Oakland Co. The characteristic V-shape radiator with German silver finish has been used, and the slope is from this point backwards in a practically unbroken line.

Although designed for exceptional roominess, the car has not the appearance of weight, and there is a surprising amount of room in the tonneau. The auxiliary tonneau seats are of the disappearing form, folding into the back of the front seat, out of the way when not in use. The new Oakland is built only in seven-passenger type, at present, and has a wheelbase of 127 in. It is to sell at \$1,585 with complete fittings.

Low Without Sacrificing Clearance

This eight, like other cars of the Oakland make, is carried low to the ground without sacrificing road clearance. The springs have much to do with this feature, the rear set being underslung. Cylinder dimensions of the motor are 3½ in. by 4½ in., giving a displacement of 346.4 cu. in. with a formula horsepower rating of 39.22. It has developed 71 hp. on the block at 2600 r.p.m., however. Other specifications include the complete Delco ignition, starting and lighting installation, cone clutch, three-speed gearset in the motor unit, open driveshaft with two universals with the Hotchkiss principle employed, one-bearing floating rear axle, three-quarter elliptic rear springs, 34 by 4½ tires, and left drive with central control. The carburetor is a Stromberg, and is fed by the Stewart vacuum system.

Ample power is invested in the engine to secure excellent performance at all speeds. It has a wide range of flexibility, will throttle down to a walking pace, and possesses quick pick-up to high speed. It is to be expected that an engine of this power would handle such a vehicle with great satisfaction to the owner, especially that type of driver who is adverse to manipulating the speed-change lever.

This eight is of the type in which the crankcase is split vertically, each half being cast in unit with one block of cylinders, and the two bolt together to form the complete engine. A stamped oil pan attaches to the bottom; the gearset

bolts to the rear of the built-up crankcase; and there is another stamping to house the front driving gears and chain. Removal of the steel oil pan exposes all of the bearings and the camshaft with its contacting tappets. The left half of the crankcase carries the camshaft and crankshaft, the caps for the bearings facing the other half of the crankcase.

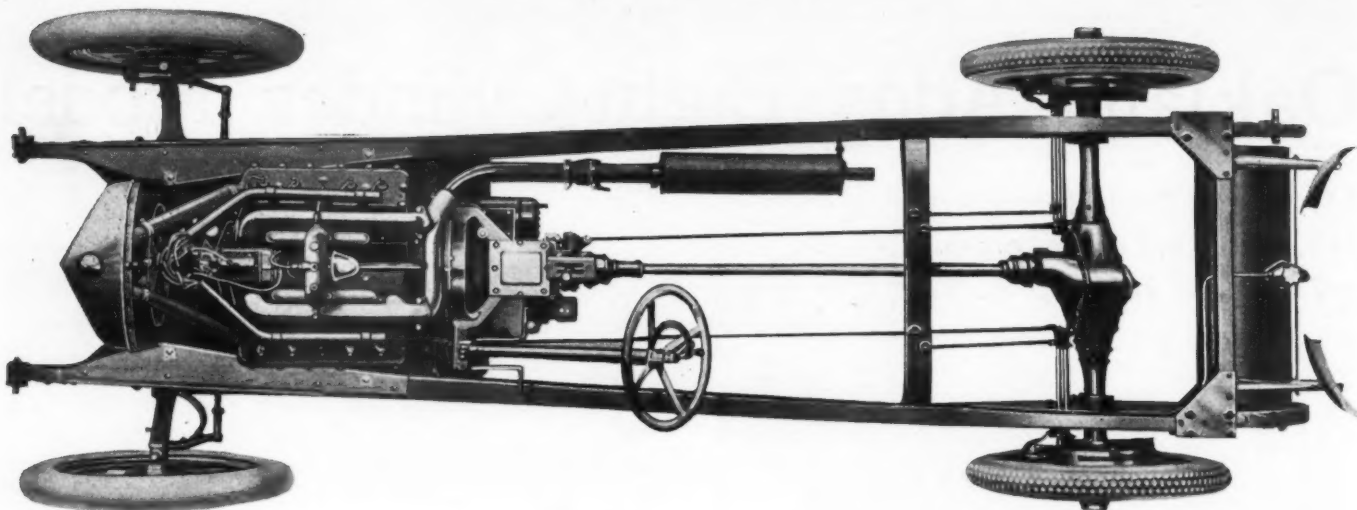
In the general layout of the powerplant, the various units are all very nicely taken care of, and there is nothing which can be criticised from a practical engineering standpoint. The cylinder heads are detachable, providing for access to the pistons and valves through the top, as in most motors now made with the crankcase and cylinder block in unit. Thus the desirable feature of being able to get at the pistons quickly has not been sacrificed, and rigidity is still maintained.

A single camshaft is used, there being a separate cam for each valve. In order to make the valve pockets as short as possible, and at the same time to use one camshaft, the valves have been inclined to the cylinders sufficiently to bring them out at the bottom and close to the combustion chambers at the top. From an external glance at the engine it would seem impossible for each valve to have its own cam, since the cylinder blocks are directly opposite one another. They are in reality staggered sufficiently to allow sufficient room for the tappets and cams side by side, the offsetting of the cylinders with respect to those on the opposite side being done within the castings.

Standard practice obtains for the valve mechanism with the exception of the seating of the valves on an angle as already mentioned. The tappets are provided with rollers and drive of the camshaft is by gear connection with the crankshaft directly below.

All Shafting Inclosed

On the outside of the camshaft gear is a sprocket over which runs a silent chain to drive the fan and generator shaft, which is also vertically above the crankshaft and camshaft. The front end of this upper shaft drives the fan; at its center it drives the ignition distributor; and at the rear the generator couples on. So a very compact assembly is attained, the end of the generator protruding only a short distance into the front of the V. The steel cover very neatly



Plan view of Oakland eight-cylinder chassis showing layout of unit power plant, Hotchkiss drive, etc.

encloses the whole driving apparatus, and another housing extends out from the top of it to enclose the small shaft at the top, forming a mounting for the distributor at the same time. There is, therefore, no exposed shafting whatever, a feature which should work to the advantage of the mechanism, since any enclosed apparatus should necessarily be proof against dust and dirt, should be better lubricated and less noisy.

A feature of the engine is the counterbalanced crankshaft. This is made by forging crescent-shaped counterweights integral with the crank arms, one to counterbalance the weight of each set of rods. There is a weight protruding from the main bearing end of each arm, making for correct balance of the rotating parts, and taking care of the oscillatory effect of the connecting-rods. The counterbalancing is done to reduce vibration from this source to the minimum, with the result that a very smooth running engine is secured. In fact, there seems to be no periodic vibration at any speed within the possible driving range.

Aluminum Pistons Used

Oakland is using aluminum pistons successfully in this engine, they also playing a part in the promotion of sweet running at high speeds. Connecting-rods are of the forked type mating with small-end rods on the opposite side. The camshaft is a carbon steel forging, and like the crankshaft, has three bearings of phosphor-bronze.

For the sake of balance, there are two yoke-end rods on one side and two on the other. The yoked rods have bronze-backed, babbitt-lined bushings, which, besides being clamped in the rod ends, are pinned to prevent rotation. The inner rods oscillate on the outside of these bushings and, while the ends of the forked-rods are not adjustable, the inner rods can be adjusted by the use of shims. However, in an eight, where the oil pressure is high, and where special bushings such as these are employed, adjustment is not required, and with proper care they should run satisfactorily for a long period—probably two seasons at least.

The crankshaft bearings have these dimensions: Front, $3\frac{3}{4}$ by 2 in.; center, 3 by $2\frac{1}{16}$ in.; rear, $3\frac{15}{16}$ by $2\frac{1}{4}$ in.; connecting-rod bearings (on crankshaft), $2\frac{1}{4}$ by $2\frac{1}{2}$ in.

Pressure running from 30 to 40 lb. per sq. in. is used in the oiling system when the engine is running at high speed, after being warmed up. At normal speed it probably rises to about 20 or 25 lb. per sq. in. The pressure is produced by a gear pump on the front end of the crankshaft, housed in the lower part of the timing gear case. The oil is drawn from the base, and then sent through a pressure regulating valve, after which it goes directly to the main bearings. From there it runs to the rod bearings through holes drilled in the webs

of the crankshaft. The pressure regulating valve is fitted with a by-pass, and when the pressure for which it is set is reached, this by-pass is opened and the overflow runs to the camshaft bearings and to the timing gears and chain. The spray from the connecting-rod bearings is thrown up into the cylinders to lubricate the walls and pistons.

A filler and breather pipe is placed on the right side of the front gear cover. This makes a most convenient location for a filler, as it is an easy place to reach with the oil supply.

Delco Electric System

The electric system is entirely Delco. Positions and method of drive of generator and distributor have already been touched upon. The starting motor, which is entirely separate, is hung from a supporting bracket on the right rear of the power plant alongside of the gearset. The starter drives through the flywheel, with the teeth of which the pinion on the end of the starter motor shaft meshes. The Bendix type of connection is used, in which the meshing and demeshing is entirely automatic when the current is sent to the electric motor.

Adequate cooling facilities are provided by a double centrifugal water pump, cleverly mounted on the front end of the camshaft extension and outside the timing gear housing. In this position the pump drive could not be much simpler, and at the same time, there is the advantage of having the pump equi-distant from each cylinder block so as to assure uniform circulation. The intake pipes run from top and bottom of the pump to the front of the cylinder castings.

Fan Drive by Friction Clutch

The fan drive is through a friction clutch on the end of the generator shaft, and the fan can be turned by hand, but the clutch has sufficient tension to prevent slippage when the engine is driving it. The center of the fan encloses a coil spring which bears at one end against a plate on the end of the shaft and at the other against the fan, thus making a friction connection. Such a friction arrangement is used to safeguard the drive.

On the left side of the gearcase is mounted a Stewart single-cylinder tire pump which is driven from the reverse idler gear. It is operated at 2.6 times engine speed and is readily thrown into mesh.

Six springs equally spaced around the clutch cone hold it in engagement, and there is also a clutch brake to prevent spinning and make for easy gear shifting. The gearset uses ball bearings, and the gears are of high carbon chrome-nickel steel. A form of yoke surrounds the flywheel to carry the gearbox, leaving the top and bottom of the flywheel exposed for timing purposes.

Final drive is made very simple through adherence to the

Hotchkiss drive system which has featured Oakland cars for several seasons. The propeller shaft is tubular and of open construction with a universal at gearbox and axle ends. No torque arms or radius rods are used, but drive and torque are taken through the springs, the master leaf of each rear spring being designed for the service.

To how great an extent simplicity has been attained is shown very clearly indeed by the chassis plan view on the opposite page; the chassis is as handsome as the car.

Spiral bevel driving gears are fitted to the rear axle which is of the one-bearing floating construction. There is a Hyatt roller bearing at each wheel, and the differential unit is carried on Hyatts, with New Departure ball thrust bearings at either side and ahead of the driving pinion. The axle housing is a strongly proportioned steel pressing, having a large plate at the rear for access to the differential.

As in other Oaklands, this car has the form of frame in which the channel is made quite deep to meet the running board brackets. No apron is used between frame and running boards, the sides of the frame acting in that capacity. This does away with one extra part and makes a simple construction. The frame tapers practically its entire length, being quite narrow at the front to give a good turning radius. The characteristic Oakland rocker bearings for the mounting of the brake equalizer and the control levers and brake pedal connection are used.

Body construction is light by the use of a wood framework and steel sheets. Fenders are crowned, and the standard body color is a coach green.

It goes without saying that the equipment of this latest addition to the Oakland range of models is entirely in keeping with the character of the car as a whole.

Building the Timken-Detroit Axle Co.'s New Drop Forge Plant



Detroit, Mich., Oct. 23.—The new drop forge plant which is now being built across Clark Avenue from the main plant of the Timken-Detroit Axle Co. will be about 558 ft. long, 70 ft. wide, and 50 ft. high. It is of steel construction, the sides from the ground up on both sides being of glass set in steel frames.

In the new drop forge will be thirty-three hammers ranging in size from 1500 lb. to 8 tons. They are all set on a concrete base and a bed of wooden spiles to eliminate as much of the jar as possible.

Three self-stoking Wicks boilers generating 1200 hp. will supply the power for these hammers. The exhaust steam will be used in a turbine motor to generate electricity for use in the drop forge. Running the full length of the drop forge on the inside will be a 40-ton traveling crane to carry the dies from the die room to the hammers, and to carry raw forgings to and from the hammers throughout

the shop. Out in the stock yard, which runs the entire length of the building, is another 5-ton magnetic traveling crane which will unload the freight cars and move stock around in the yard up to the door of the drop forge where the 40-ton crane will pick it up.

In the die room will be another smaller crane to move the dies to and from the forge shop.

All of the steam pipes and power pipes going from the boilers to the steam hammers will be contained in a tunnel running through the center of the shop, thereby eliminating all piping over the hammers. The exhaust steam from the hammers will be carried back to the engine room by the way of this same tunnel. There is also a tunnel running from the drop forge under Clark Avenue to the main plant so that the truckers carrying stock back and forth will not have to go out of the buildings.

The FORVM

Fallacy in Twelve Argument — Six Balance Better Than Allowed

By David Fergusson

Mechanical Engineer Pierce-Arrow Motor Car Co.

EDITOR THE AUTOMOBILE:—There have been many articles published during the past few months on the twelve-cylinder engine; in all these there is generally found the statement that in the twelve V-type engine with six cylinders on each side, 60 deg. apart, the force due to the inertia of the reciprocating parts, which is recognized as being of tremendous moment, is only half that of a six-cylinder engine of the same total cylinder volume.

In some of these articles, a direct comparison has been made between a six-cylinder 4 by 5½-in. engine and a twelve-cylinder 3 by 5-in. engine, the total cylinder volume of each being practically alike. In this case the smaller piston, together with the reciprocating part of the connecting-rod, weighs about one-half of the corresponding parts of the larger piston. It is then assumed that the twelve-cylinder engine is merely two sixes and that the inertia loads present in the twelve-cylinder type of engine are those due to one piston complete, with the small end of one connecting-rod. I have been waiting for someone to point out the fallacy of these assumptions, and as no one has done so, I feel impelled to myself bring the following to your readers' attention.

There is, in my opinion, considerable misunderstanding in regard to the stresses in the conventional twelve-cylinder, V-type engine. This should be considered not as two six-cylinder engines, but as a twelve with all cylinders vertically in line. This alters the case entirely, and gives a much more correct impression of the loads that must be provided for. We then find that the inertia of the reciprocating parts to be considered is not that of one piston and the part weight of one connecting-rod, but it is double this, as two connecting-rods and two pistons are attached to one crankpin. Two pistons 3 in. diameter complete, with the reciprocating parts of two connecting-rods, weigh at least as much as one 4-in. diameter piston complete with the reciprocating part of its connecting-rod. Therefore, the inertia load in the case of the twelve is as great as in the large diameter six and, therefore, necessitates as large a diameter crankshaft, and this shaft must, in addition, be very much larger in diameter in the case of a three-bearing crankshaft than is necessary in a seven-bearing shaft.

It will be contended that the assumption of all the twelve cylinders being in line is not a fact, as the six cylinders a side are placed at an angle of 60 deg., this certainly reduces the resultant inertia loads, but only about 18 per cent. It is, therefore, much safer to consider this in the manner indicated, especially as twelve cylinder engines are being run at a higher speed. The combined inertia force at high speeds being greater than the explosive force, it is quite possible that the twist of the crankshaft, due to the force created by the inertia of the reciprocating parts, may be almost as great in the twelve cylinder engine as in the six, in which case the vibration coming from a torsional twist of the crankshaft should be almost as great in the twelve-cylinder crankshaft, as in the six, if the same diameter shaft is used in both cases.

ARGUING BALANCE.
THE SIX AND THE
TWIN SIX DISCUSSED
FROM DIFFERENT
VIEWPOINTS OF THEORY

Twin Six Balance Superior

By J. G. Vincent

Vice-President of Engineering, Packard Motor Car Co.

EDITOR THE AUTOMOBILE:—I have read with interest the proof sheet of Mr. Fergusson's remarks regarding articles recently published on the twin six or twelve-cylinder engine. I would like to comment on the points that he has raised, as follows:

Mr. Fergusson refers to a direct comparison that has been made between a six-cylinder engine, 4 by 5½ and a twin six engine, 3 by 5, and as these are the sizes of engines referred to in my paper before the Detroit Section of the Society of Automobile Engineers on Sept. 16, and before the Indiana Section of the Society of Automobile Engineers on Sept. 24, my comparisons are, perhaps, the ones referred to.

In the first place I must disagree with Mr. Fergusson regarding the relative weight of 3-in. and 4-in. pistons, as, from my personal experience, I am convinced that it is not possible to make a 4-in. piston assembly complete with piston rings, piston pin, piston pin set screw and cotter pin that will not weigh more than twice as much as a 3-in. piston assembly of corresponding design. In my paper before the Society of Automobile Engineers, I included the following figures regarding reciprocating and rotating weights and their inertia effect, which were taken from three actual motors:

	338 Six, Lb.	Special 338 Six, Lb.	Twin Six, Lb.
Piston assembly, complete with rings, piston pin and set screw.....	4.125	2.11	0.814
Connecting-rod upper end.....	1.38	0.828	0.625
Connecting-rod lower end.....	3.31	2.421	1.52

The following table gives a comparison of forces due to gas pressure and inertia at 2000 r.p.m. of the same motors:

	2,130	1,140	492
Inertia of one piston assembly complete...	2,130	1,140	492
Centrifugal forces of one connecting-rod lower end.....	1,030	754	430
Centrifugal forces of one pair of connecting-rod lower ends.....	....	....	860
Crankpin bearing pressure per square inch due to inertia.....	768	433	379
Crankpin bearing pressure per square inch due to gas pressure.....	916	916	871

The column of figures under 338 Six was taken from one of our last year's standard six-cylinder motors. The column of figures under Special 38 Six was taken from a motor of substantially the same design as last year's 38, but with re-proportioned length of crankshaft bearings, the lightest possible connecting-rods, machined all over, and equipped with special alloy pistons. The column of figures under Twin Six was, of course, taken from one of our standard engines.

As suggested by Mr. Fergusson it is, of course, correct to

add the upper end of the connecting-rod to the piston assembly to get the total reciprocating weight for each cylinder. By this process we get the following information from the figures on the previous page:

Total reciprocating weight of 338 6-cylinder motor.....5.505 lb.
Total reciprocating weight of special 38 6-cylinder motor....2.938 lb.
Total reciprocating weight of twin six motor.....1.439 lb.

Now in regard to Mr. Fergusson's suggestion to consider the twin six as having twelve vertical cylinders, I certainly must take exception to this method of treating the subject, as all my arguments have been based on the V-type or twin six motors and not twelve-cylinder vertical motors. It is true that the inertia forces of a twelve-cylinder motor overlap, as suggested by Mr. Fergusson, and his statement that the net inertia effect is only approximately 18 per cent less than it would be in a single six-cylinder vertical engine, whose reciprocating parts weighed twice as much as the twin six, is approximately correct. Figures from actual parts, however, throw considerable light on this subject.

Let us see how this works out in actual practice, taking Mr. Fergusson's method of figuring:

As outlined above, the reciprocating parts in a single cylinder of a Packard twin six motor, 3 by 5, weigh 1.439 lb. and two complete sets of reciprocating parts, therefore, weigh 2.878 lb. Deducting 18 per cent from this weight, leaves a net weight of 2.36 lb. as the figure to be used in computing the combined inertia effect of the two sets of pistons and rod upper ends in the twin six motor.

As outlined above, one piston assembly and rod upper end of the 3-38 motor weighed 5.505 lb. or considerably more than twice the equivalent weight of 2.36 lb. for two sets of reciprocating parts of the twin six.

As mentioned in my paper before the Society, it might be argued that this is not a fair comparison. My reason for giving these weights is to show what has been considered good practice in six-cylinder motors of approximately 4 in. bore by 5½-in. stroke. It was for the purpose of putting this argument on a strictly engineering basis that I included the figures for the special 38 motor which I believe to have been equipped with reciprocating parts as light as it is possible to make them, and probably slightly lighter than can be produced in actual manufacture. By using reciprocating parts of this special motor for comparison, we obtain a figure of 2.938 lb. to be used in direct comparison with the net figure of 2.36 lb. of the twin six, or a difference of 0.578 lb. in favor of the twin six construction.

By calculating the inertia effect at 2000 r.p.m. for the twin six motor, and for this special 3-in. by 5½-in. six-cylinder motor, we obtain a figure of 670 lb. for the twin six, and 918 lb. for the special six, or 248 lb. in favor of the twin six construction.

The corresponding inertia effect of the 3-38 motor, which I maintain has been considered good six-cylinder practice, amounts to 1712 lb. or 1042 lb. in excess of the twin six construction.

Effect of Speed

Now, as to Mr. Fergusson's suggestion that something ought to be figured in on account of the twin six motor being run at higher speed, I wish to state that I do not consider this proper engineering, because the two motors should be compared at the same motor speeds. My reason for making this statement is that the twin six type of motor will develop more power than the single six-cylinder motor of the same piston displacement, at the same motor speed, and this being the case, it would actually be necessary to run the twin six motor at a lower speed than the single six, in order to have it only develop the same amount of power.

The fact, however, that the inertia forces are less in the twin six motor, makes it possible to run it at higher speeds and thus obtain larger range of ability without undue bear-

ing pressure due to or arising from the forces of inertia.

I have carefully noted what Mr. Fergusson has to say about crankshaft design. A great many things must be taken into consideration when designing a crankshaft, particularly its length, and the magnitude of the power impulses as well as the forces due to inertia. I have proved by exhaustive experiments that there is considerable advantage in the three-bearing shaft over the seven-bearing type, providing the motor is short enough overall to permit of proper strength in the design to resist the bending forces. I would like to outline what I consider to be the main advantages of the three-bearing shaft, as follows:

First: The main bearing portions of a crankshaft are, of course, its weakest points, so far as resisting torsional displacement is concerned, and the more main bearings it is found necessary to use, the longer this section of the shaft will be, and its ability to resist torsional displacement will be correspondingly reduced.

Second: I have found from actual experience, that a single long bearing is much better than two short bearings of the same total length, partly on account of the extra loss of fillets in the two short bearings, but primarily on account of the fact that there is not the same tendency for the oil to work out of the long bearing, as it has to travel twice as far before actually getting out of the bearing.

Third: A proper balance between the forces due to inertia, and the forces due to the power impulses is much easier to obtain in a three-bearing shaft for the following reasons: The center bearing of either a single or twin six motor is the one that is apt to have the highest bearing pressures, unless the designing work is very carefully done. In a seven-bearing shaft it is, I believe, correct to assume that the pressure due to each working stroke is equally distributed over two main bearings; that is, the pressure, due to the working stroke of piston No. 3 will be distributed over main bearings, Nos. 3 and 4, and assuming that with this design these bearings are properly designed to carry this load, we will obtain comparatively short bearings, or, in other words, approximately the length of main bearings that has been common practice in seven-bearing shafts.

If we take these bearings as a basis, and then consider the bearing pressures due to inertia, we will discover that the center bearing pressure will run excessively high, as in this design one-half of the inertia effect of rods and pistons in both cylinders 3 and 4, must be considered as concentrated on the center bearing.

If a seven-bearing shaft is to be designed to have its bearing pressures properly equalized, it will be found necessary to make the center main bearing something like twice as long as the other intermediate main bearings, and this is usually found impossible, on account of the excessive length that will result.

In a three-bearing shaft there are but eight cheeks, while in a seven-bearing shaft there are twelve cheeks, and all other things being equal, it is, of course, true that the total main bearing length of a seven-bearing shaft is cut down by the total width of the four additional cheeks, or else the motor will have to be made correspondingly longer, and this loss in bearing length, coupled with the loss of bearing efficiency, due to the difficulty of keeping oil in the several short bearings, certainly works to the disadvantage of the seven-bearing shaft.

So far as the inertia forces are concerned, the three-bearing shaft is, therefore, the best, and it is only necessary to use more bearings when the crankshaft has to be so long that it would bend under the influence of the power strokes.

One of the most attractive features of the twin six construction is the fact that, due to the small magnitude of the separate impulses and the short compact form of motor on account of its small bore, it is possible to use an ideal design of the six-cylinder, three-bearing crankshaft.

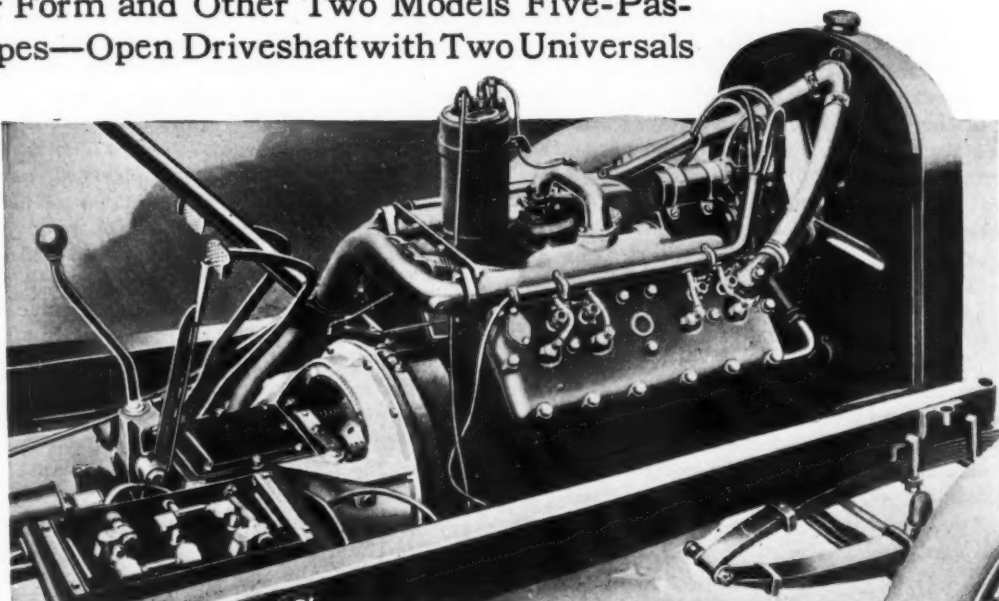
Two Jackson Eights and a Four

Elliptic Springs All Around—Large Eight in Seven-Passenger Form and Other Two Models Five-Passenger Types—Open Driveshaft with Two Universals

THE Jackson Automobile Co., Jackson, Mich., has an ambitious program for the coming year and is the first manufacturer to announce two eights of different capacity. Both will have Northway motors, the larger the engine which was introduced last winter and the smaller a new motor modeled upon the same general design. In addition there will be a light four with a high-speed type of engine and it is expected that this will be a very popular car.

The light four is a Northway motor like the eights, having dimensions $3\frac{1}{2}$ by 5 in.—192 cu. in.—and, being carefully balanced, its ability for high-speed running can be made use of freely. It is the idea of the Jackson company that there will be a large demand for a thoroughly good and well finished four-cylinder car despite the low prices of some sixes and eights, so it is making an excellent job of its four which is listed at \$985.

The smaller of the eights has $2\frac{7}{8}$ by $4\frac{1}{4}$ bore and stroke, or 246.7 cu. in. and the larger $3\frac{1}{2}$ by $4\frac{1}{2}$ in., giving a piston displacement of 346.3 cu. in., the prices being \$1,195 for the smaller and \$1,685 for the larger car. Only the large eight has a seven-passenger capacity, the other two being supplied with five-passenger touring bodies. A feature common

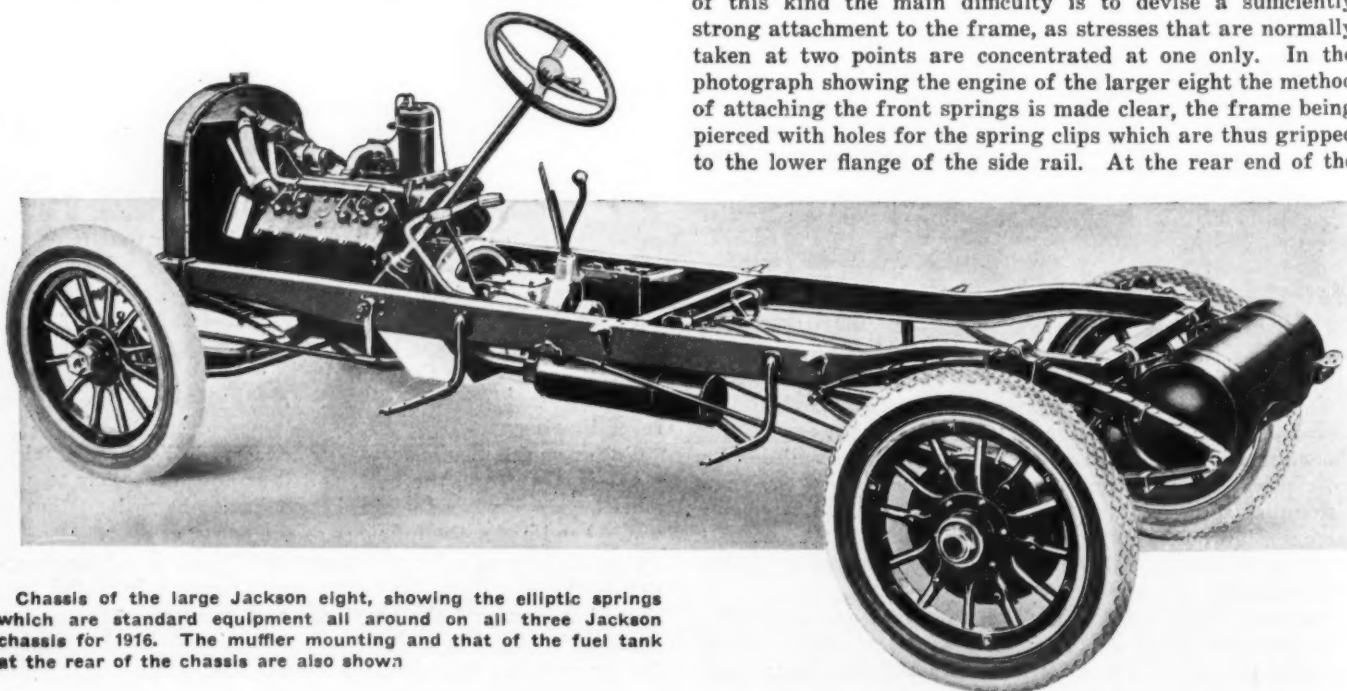


Northway eight power plant used in the large Jackson eight-cylinder model for 1916. Note the vacuum fuel feed tank and the single exhaust manifold

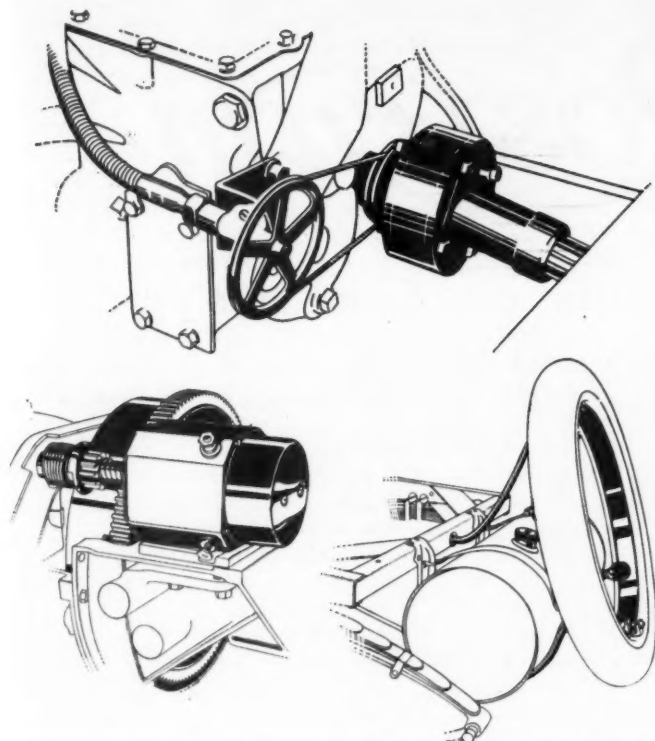
to all three cars is high finish for the bodies and the use of really good leather upholstery. Also the Jackson company is to be congratulated on having broken away from the conventional black paintwork, as the four is finished in a rich maroon tint, the small eight in dark green with natural wood wheels, and the large eight in dark blue.

Elliptic Springs Employed

On all Jackson chassis both front and rear springs are full elliptic, giving an unusual amplitude of motion and ability to take really bad roads in comfort. In using springs of this kind the main difficulty is to devise a sufficiently strong attachment to the frame, as stresses that are normally taken at two points are concentrated at one only. In the photograph showing the engine of the larger eight the method of attaching the front springs is made clear, the frame being pierced with holes for the spring clips which are thus gripped to the lower flange of the side rail. At the rear end of the



Chassis of the large Jackson eight, showing the elliptic springs which are standard equipment all around on all three Jackson chassis for 1916. The muffer mounting and that of the fuel tank at the rear of the chassis are also shown



Above—On all Jackson models for 1916 the speedometer is driven by belt from the front universal. Note the splined telescope slide mounting for the universal

Below at left—How the starting motor is mounted at the flywheel
Below at right—Rear spring attachment and mounting of spare tire carrier. Note the round gasoline tank for maximum strength with minimum liability to leak

frame the other springs are attached in the same manner except on the large eight where a swivel mounting is used.

The largest car has both torque and radius rods, so as to relieve the springs of all stresses save those imposed by the load, but the two smaller chassis have only torque stays, driving effort passing through the springs. In practice it seems that this gives a very easy and elastic drive, the flexibility of the spring acting as a cushion.

Not long ago the Jackson company was using a single universal with the propeller shaft inclosed, on some of their models, but this design has now been abandoned in favor of the open type shaft with a universal at each end. The rear axles are all floating and the gear ratios on high are 4.4 to 1 on the four and small eight, and 4.25 to 1 for the large eight. It should be mentioned that telescopic motion of the drive shaft is cared for by mounting the front universal upon a large splined shaft, which eliminates a universal combining sliding with the other motion. This makes for easy inclosure and better lubrication of the joints.

Autolite Electric Equipment

On all models the two unit Autolite system is used, the distributor being combined with the generator. The starting motor is carried low on the crankcase side, and the generator is between the cylinders on the eights, being mounted in the usual place on the four. Fuel is supplied by a Stewart vacuum tank sucking from a rear tank which is made of round section so as to give the greatest possible strength and minimum of liability to leakage.

The Power Plants

Returning to the power plants, each of these includes a cone clutch with external springs and a three-speed gearset, and both the eights are of the same sort of design having the crankcase divided vertically, the cylinder blocks being cast integral with half the case. The large motor is practically unchanged since the Northway company first intro-

duced it early in the present year and the small one is different only by the fact that it has a two-bearing crankshaft instead of the three bearings used for the larger engine. Both have pressure lubrication of a most complete kind and a single camshaft with sixteen cams. The same style of forked connecting-rod is used for both motors, this having proved extremely satisfactory in the large number of Northway eights that have been put in the hands of private users during the last six months. The cylinder heads are detachable, which makes a light task of the occasional necessity for cleaning out carbon, and the spark plugs are located centrally which is usually assumed to be the most efficient position.

Wide Steering Lock

The Jackson company makes a feature of its wide steering lock which makes the car convenient to handle in cities or in exceptionally rough country. To enable the fullest value of this to be obtained the wheelbases have been kept fairly short, that of the four and small eight being 112 in. and that of the large eight 124 in. Tires are 32 by 4 all round on the smaller chassis and 34 by 4½ on the big eight.

Runabout bodies are supplied instead of the five-passenger equipment, on the four and the small eight, but the large eight will be made with a seven-passenger touring body only. The runabout type is very good in both appearance and comfort and has a most capacious boot, or rear storage space, which is always extremely useful for touring. It should be remembered that the Jackson company also can provide its special Transcontinental body, in which the seat back of the front compartment can be let down and a comfortable bed made with the upholstery and cushions. This body has met with a considerable success since its introduction a few months ago and it is surprising that the type is not more common, considering the popularity of camping on tours.

A Good Book for Draftsmen

To books intended to assist the young draftsman there are no end, but one of the best and clearest is the latest addition, published by G. P. Putnam's Sons, New York, and The Cambridge University Press, England. The author is John Handsley Dales, former head of the engineering department of Bradford (England) Technical College. Commencing with instructions on such simple yet elusive things as the proper method for sharpening a pencil, the book continues with a series of drawing exercises designed to train hand and eye in the manipulation of all the tools of the draftsman's trade.

No questions of machine design are considered, the book's sole purpose being to teach drawing and it should be of very real assistance in developing combined speed and accuracy. Perhaps it is rather a college primer than a factory library volume, but there are few juniors in automobile drafting rooms who would not be benefited by a careful perusal of the volume and by some practice with the exercises. The title, *Mechanical Drawing* (Dales), does not give much idea of the usefulness of the book.



The small eight-cylinder Jackson with the new body



The Rostrum

Flying Paper Dangerous on Speedways

EDITOR THE AUTOMOBILE:—In the interest of fair play and best results in speedway contests, it would seem only fair to recommend that some action be taken in future contests to have men stationed around the track to remove scrap papers which—through one cause or another, may get onto the track.

The writer noticed two laps before entry No. 2, Peugeot, driven by John Atkin withdrew from the race with a cracked cylinder, that his radiator was almost entirely blanketed by a sheet of paper picked up on the track, and without any doubt this had a very considerable bearing on the withdrawal of this car. The writer also noticed that there was a great amount of loose paper, particularly on the bank

track at the right of the grandstand, which paper was in a state of constant motion as the cars passed through it.

In view of the results of the race, it is very improbable that had the paper not been on the track the results achieved by the winners would have been any different, but it leaves in the mind of the spectator a possible doubt as it allows an element of luck, which should not be present, to enter into the final result of the race.

We thoroughly believe that American built cars can repeat or even better the records made, and we wish to accomplish this result without a shadow of doubt as to the conditions.

H. R. S.

Schenectady, N. Y.

Probable Effect of Lighter Flywheel

Editor THE AUTOMOBILE:—What would be the result of putting a smaller flywheel on an automobile engine? Would it make a faster easier-pulling engine where used in a stripped car weighing say about half as much as the touring car in which the engine is used? My idea is to use the flywheel of a 4 by 4 motor on a 4½ in. by 5 motor. Both motors are identical except as to size and also size of the cars they were used in. Both are the same make and same year model.

Would you advise using the lighter flywheel for the cut-down car?

Columbia, S. C.

C. M. L.

—It is not advisable to put a lighter flywheel on a motor unless it is to be used for high speed work only. The lighter the flywheel the more unevenly a motor runs at low speed and this is quite noticeable in a car used for ordinary work. On racing cars, however, where most of the traveling is at very high speed a much lighter flywheel can be used than in the case of touring cars. Therefore, unless you intend using the car for only high-speed work it would be advisable to keep the standard size flywheel.

Applying Stewart Vacuum to Cadillac

Editor THE AUTOMOBILE:—Can you please tell me if a Stewart vacuum gasoline system can be successfully installed on a 1915 Cadillac eight touring car, and if it can be installed, will you kindly publish instructions how to do it?

Bangor, Me.

F. H. C.

—The Stewart vacuum system can be installed on a Cadillac eight, the model 113-K being the best for the installation. The instructions for installing are as follows:

Place the tank on engine side of dash, right hand side of car, as high as possible.

Use 4½ in. wheel gear spacers under the bracket. This will permit setting the bracket out from dash far enough to clear a pipe that will otherwise obstruct.

Move both brackets on the tank as close together as possible.

Tap the neck of the carburetor above the butterfly valve instead of tapping the manifold, which is water-jacketed.

Five Cylinders Hard to Balance

Editor THE AUTOMOBILE:—Why is it that automobile manufacturers never build a five-cylinder motor? In a five-cylinder, four-cycle motor, there would be a continuous turning effort of the crankshaft, due to the overlapping strokes, the one added cylinder being sufficient to cover the interval of "no power" which is present in the four-cylinder type of automobile engine.

A five-cylinder motor has the least number of cylinders to have continuous power and therefore seems to me should have been the next step after the four.

Since the greater number of cylinders creates the greatest smoothness, it is evident that absolute smoothness can never be attained, no matter how many cylinders are used. For this reason, the most practical motor in my judgment would be a five, as it has the least number of cylinders to give continuous power.

K. B. W.

E. Orange, N. J.

—A five-cylinder engine is only in proper balance when the cylinders are arranged star fashion as in some aeroplane motors. This means that a vertical cylinder motor with five cylinders would vibrate a good deal. It would not run smoothly like a six. Vibration has nothing to do with the overlap of power impulses and it is freedom from vibration more than the even torque which accounts for the great popularity of the six.

Ford Direct Ratio 3.63 to 1

Editor THE AUTOMOBILE:—Am asking the following questions with the idea of using Ford axles in the construction of a light car, roadster model for three passengers, using the conventional type of frame and cantilever rear springs and semi-elliptic front springs.

1—Please advise if a Ford rear axle will support a three-, or four-passenger car of about 1900 lb., using spring seats on the axle housing about 32 in. between centers.

2—Give the ratio of driving gears.

3—Will the rear axle stand a four-cylinder, high-speed motor 3¼ by 5, developing about 18 hp. at 1000 r.p.m.?

4—Suggest a method and give a sketch of attaching semi-elliptic springs to the Ford front axle about 27 in. center.

5—Give dimensions of shaft required to fit transmission end of universal joint, also dimensions of propeller shaft end.

Owensboro, Ky.

F. S. B.

—The Ford rear axle should be able to support the load you mention.

2—The ratio of the rear axle driving gear is 3.63 to 1.

3—The rear axle is capable of transmitting 18 hp.

4—This is a straight job and merely consists in having the necessary fittings made to fit the frame and axle.

5—A sketch is given in Fig. 1, which will give the dimensions of the part which you need.

Testing Spark Plugs and Cylinders

Editor THE AUTOMOBILE:—Kindly give me the different methods for testing the effectual working of the spark plugs in giving equal and uniform explosions, if there is any variation owing to the strength or power of the spark.

2—Likewise kindly give the different methods for testing out the efficiency of each cylinder for suction of the carbureted gasoline into it and for non-leakage of the gas from the explosion therein.

3—When the engine refuses to respond or chokes down on too sudden and too wide opening of the throttle, kindly explain the causes therefor, i.e., whether from too lean a mixture, or an over-rich mixture, or defective suction of part or all of the cylinders, or whatever they may be.

Connorsville, Ind.

H. L. F.

—The operation of the spark plug can be readily determined by eye. All that it is necessary to do is to place the spark plug points at the proper distance apart which is between $1/64$ and $1/32$ in. for magneto use and then after this approximate adjustment is made, remove the plug from the cylinder and start the engine on the other three. The color and intensity of the spark which jumps across the gap of the plug removed from the cylinder gives a ready clue to its performance when firing a charge. The spark may vary all the way from a thin, fine line to a thick dot of flame. Something between the two, or a hot, blue spark, is most desired.

2—The best method for testing the suction of each of the cylinders is by compression. Cylinders, roughly speaking, having the same compression will have the same suction.

3—The choking action you speak of is generally due to too rich a mixture. Properly designed motors, unless improperly timed, do not suffer from defective suction.

Oxygen for Removing Carbon

Editor THE AUTOMOBILE:—I have a 1915 eight-cylinder Cadillac. How far should this car be run before the carbon is cleaned out?

2—I expect to have an expert do this. What is the best method?

3—The gear ratio is $4 \frac{7}{16}$ to 1. I get about 10 and 11 miles to the gallon. If this were changed to 5 to 1, can you tell me what I would get to the gallon of gasoline then?

4—What is the best speed that this car will develop as it is with full equipment?

5—Does it harm the engine to run it at 60 m.p.h.?

New York City.

J. C. W.

—The frequency with which carbon should be removed from a motor depends upon its steady rate of accumulation. For instance, a motor considerably carbonized one day might have this carbon almost entirely burned out by driving the car at an extremely high rate of speed for a certain time. On the contrary, if the car was not subjected to this extremely high rate of speed, the accumulation of carbon would be constant. The rate of this constant accumulation depends upon the nature of the oil used, the amount of oil used, as well as the carbureter adjustment. If the oiling system is in improper adjustment so that an excessive amount of lubricant is being used, and if after such a time the mixture

happens to be too rich, the condensation of this lubricant would form a sticky film to which lamp black from the very rich mixture would readily adhere. Again, certain grades of lubricants have a larger carbon residue than other lubricants, and as any lubricant which finds its way to the combustion chamber will burn under the high temperatures reached, the greater this carbon residue in the oil, the greater will be the amount of carbon deposit. Frequency with which carbon should be removed from a motor depends upon the rate of its accumulation which may, to a certain degree, be controlled by the operator. The instruction book which is shipped with every car from this factory takes up the matter of carbureter adjustment and the nature of lubricants which should be used on Cadillac cars very carefully.

2—When necessary, carbon may be very successfully removed by the oxygen process. When using this process, however, the piston should be on its high dead center, in order to permit the head of the piston to be thoroughly burned over, and at this time both valves in the cylinder should be closed to prevent the possibility of the flame passing through the inlet valve to the carbureter, and as a further precaution the carbureter should be drained.

3—The gear ratio on this particular car is $4 \frac{7}{16}$ to 1 and the mileage is from 10 to 11 miles to the gallon of gasoline. As to the effect on the fuel consumption should the ratio be changed to a 5 to 1, this would depend somewhat upon the nature of the country. Ordinarily, of course, changing from a $4 \frac{7}{16}$ to 1 to a 5 to 1 means that for any particular road the engine would be operating at a higher revolution per minute, and a higher rate of fuel consumption might be expected. However, if this car happened to be operated in a hilly country, it is possible that by changing from a $4 \frac{7}{16}$ to 1 to a 5 to 1 the fuel consumption might be actually decreased, for the reason that with a high gear, hills would have to be negotiated with a wide-open throttle, whereas with a low gear the same grades might be negotiated readily with the throttle partially closed.

4—The maximum speed would depend upon the type of the body, whether a two-passenger, a seven-passenger or a closed type. The gear ratio, size of the tires and whether the windshield were both up or down, would also enter into this question. A complaint was received recently from an owner because his standard type 51 car would not do better than 70 m.p.h. but you probably won't want that speed.

5—The engine speed at a road speed of 60 m.p.h. depends of course upon the gear ratio. If an engine is being run under load, its tendency toward self injury will be less during this period than with the motor run idle for the same length of time at the same high rate of speed. The motor should never be run idle at high engine speeds. If, however, all parts of the car are in proper adjustment; the cooling and oiling systems in proper working condition; the bearings properly adjusted, etc., there is no reason why the usual operation of this car from its lowest to its highest speed, under the proper conditions, should be in any way detrimental or result in any other than the ordinary wear.

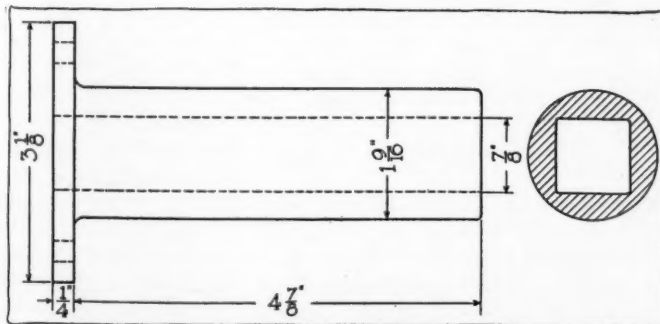


Fig. 1—Sketch showing dimensions of shaft required to fit transmission end of Ford universal joint

Bijur Electrical Units Standardized

Simpler and Lighter Construction—
Magnet Shells Cut from Steel Tube

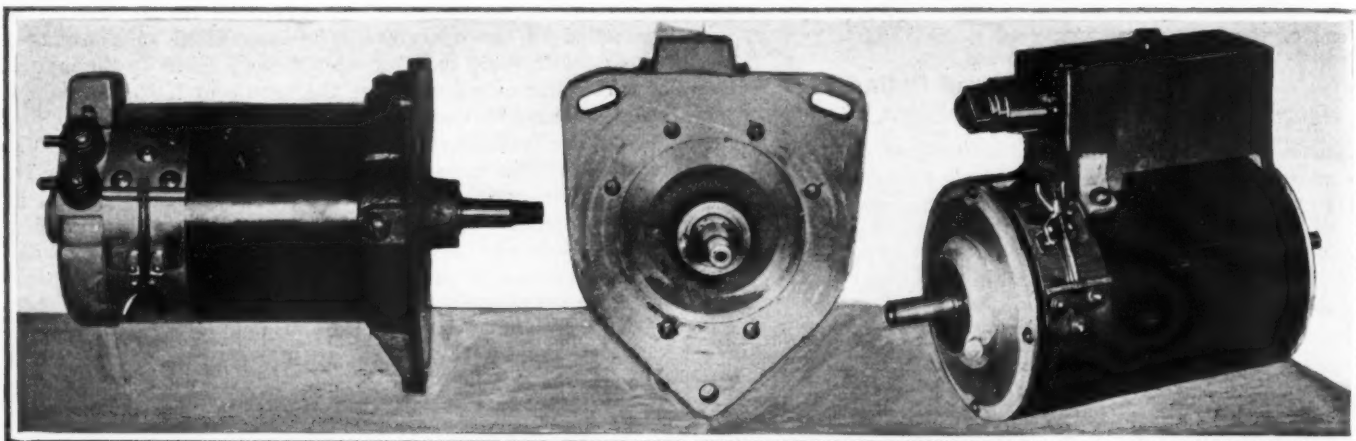


Fig. 1—Left—Constant current generator controlled by third brush principle. Center—Generator base, showing slotted bolt holes for chain adjustment. Right—Voltage-regulated type of generator with detachable regulator on top

INCREASED efficiency in conjunction with a marked reduction in the size and weight of the principal units marks the development of electrical equipments for automobiles during the past two years. Compactness is a fundamental requirement and this has led to the cutting down of much metal in generator and motor construction, especially in regard to the magnet, though there has also been much weight saving in the more efficient and compact methods of arranging the windings. With this desire for compactness has come the necessity for ease of manufacture in order to keep the production cost inside the competitive field.

After more than three years' experience the Bijur Motor Lighting Co., Hoboken, N. J., has decided that the above requirements are best obtained by the adoption of a simple cylindrical form for the field magnet casing with four inserted poles. For 1916, therefore, the Bijur output will consist of motors and generators constructionally identical, with the exception of the windings and size. All magnets are cut from seamless steel tube. All are four-polar with drop-forged poles screwed in after inserting the windings. The motors are designed for flywheel connection only either by direct sliding pinion or through reduction gear and sliding pinion. The Bijur company, however, does not supply gearing.

The generators are divided into two classes, irrespective of size, namely, the constant-current type in which the output is governed inside the generator by means of the third brush principle, and the voltage-regulated type in which a special vibrating regulator of Bijur design is mounted on top of the generator casing holding the voltage by the use of a resistance inserted in the shunt field.

Besides the separate motor and generator there is a motor-generator set for connection by chain to the engine. This design is remarkably simple and is suited to the needs of the smaller sizes of power plant.

The constant current type of genera-

tor has the great advantage of simplicity, all the control being located inside the generator casing. The third brush principle is used, in which the speed of the armature controls the amount of current passing through the shunt coils by field distortion. The outfits can be classified as follows:

- | | |
|---|--|
| A Constant current generator
Geared motor | C Voltage regulated generator
Geared motor |
| B Constant current generator
Direct acting motor | D Voltage regulated generator
Direct acting motor |
| E Motor generator | |

Vibrating Reed Regulator

The voltage-regulated generator is governed by a vibrating regulator, which is made only in one size for mounting on the magnet casing. This regulator differs from others of similar type in the arrangement of the contact points, Fig. 2, which are fitted to the ends of brass reeds so as to preserve a clean contact surface at all time by varying the actual point at which the spark occurs. The coil is arranged vertically with the hinged iron armature above. Behind the hinge on an extension of the armature one of the two reeds R1 is fitted, while the other reed R2, representing the fixed point is arranged horizontally so that the weights at the ends,

in which the platinum points are inserted, face one another. An adjustable spring which holds the armature away from the core is provided. When attraction of the armature takes place as the speed of the generator rises, the contact points are separated. This inserts a resistance connected across the contacts, Fig. 3, in the shunt field, thereby cutting down the power of the field magnet. The spring then returns the armature and again closes the points, allowing the shunt field full current on which the action is repeated. On high speeds this armature vibrates at a fast rate and the claim is made for the special reed arrangement that the contact points cannot become pitted owing to the sideways vibration of the surfaces.

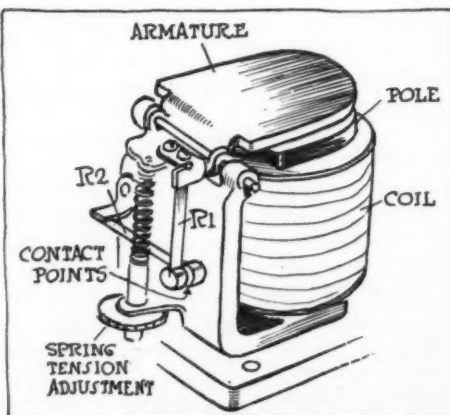


Fig. 2—Bijur voltage regulator in which the contact points are fitted to two vibrating reeds to preserve a good surface

In the same rectangular aluminum casing, Fig. 4, the cut-out *C* is fitted and all the connections to the generator are made by plugs *P*, which are inserted into sockets in the generator casing. No electrical knowledge is required in changing the regulator. The act of putting it in place on the generator and fastening it by the single thumb nut automatically makes all necessary connections through the plugs.

This feature is of great value in the case of a breakdown or failure on the part of the regulator. All the owner does is to remove it, forward it to the maker and replace with a new one. By this arrangement the maker can seal up the regulator, and repair according to guarantee only when the seals are unbroken. The connection to the outer circuit is made through a two-point plug *T*, which is inserted into a socket *S*, in the end of the regulator casing.

Chain Adjustment Provided

There are two alternative methods of fitting the generator to the engine. It may be strapped in a cradle or mounted by the end cover on the crankcase arm. In the latter method provision is made for chain adjustment through slotted holes for two of the three bolts, Fig. 1, center.

The starting motors are series wound and in the direct-acting type have either a squared shaft to take the sliding pinion or a screwed shaft for the self-acting momentum type of pinion.

The starting switches, Fig. 4, are plunger operated and can be located under the floor with the plunger projecting for foot actuation or interconnected with the pedal that brings the driving pinion into mesh with the flywheel. A flat resistance is incorporated in the switch which is included in the circuit on the first movement of the plunger and cut out when the plunger is pushed home. This insures easy meshing and a gradual start.

By using the third brush principle of regulation on the motor generator the moving parts are brought down to the minimum. The field coil for generator purposes is a shunt across the third brush and one of the main brushes, Fig. 3. When the car slows down below the minimum charging speed the unit automatically takes up its duties as a motor helping the engine. By this means the engine is prevented from stalling.

How Magnets Are Made

The method of manufacture of the magnets and the assembly of the windings are of particular interest. Raw stock in the form of seamless steel tube is fed into automatics

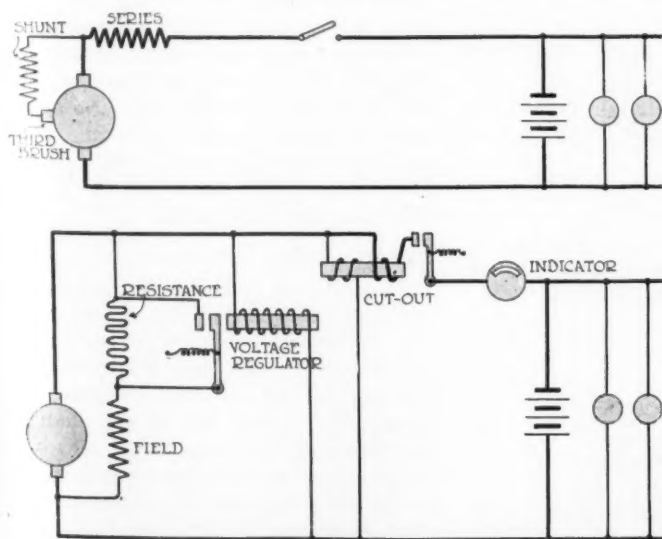


Fig. 3—Top—Diagram of connections on the motor-generator, showing the third brush control method. Below—Connections of the voltage-regulated generator and external circuit

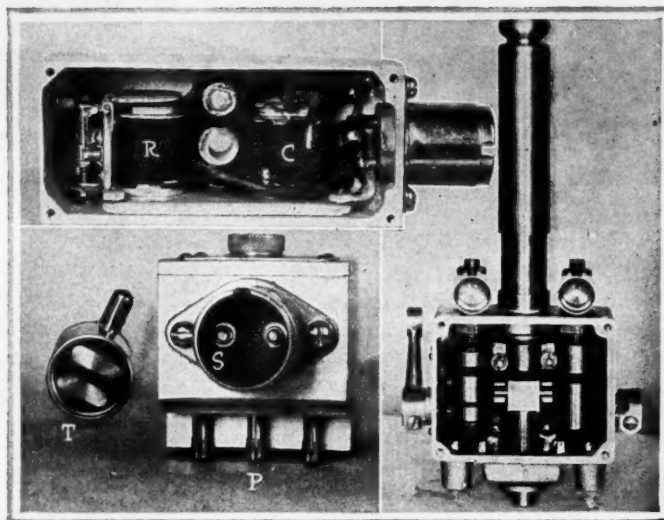


Fig. 4—Left—Interior and end views of the Bijur regulator which is connected to the outer circuits by a change over plug *T*. Right—Plunger type of starting switch with barrel contacts

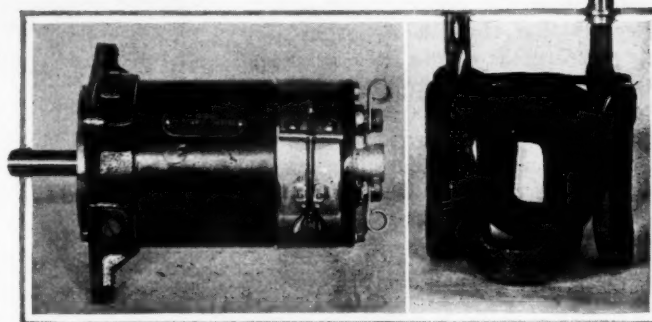


Fig. 5—Left—Bijur starting motor with squared shaft for sliding pinion. Right—Assembly of starting motor field coils

which machine inside and out and cut off to the required length, facing both ends accurately. The shells are then taken to a large press which punches out the holes which give access to the brushes. Until this year this particular operation was performed in the milling machine, which was naturally several times slower than the cold punch. The poles are drop forgings which require only slight grinding to true up. This is done by clamping twenty-four at a time on a mandril, which is inserted in an automatic grinder. The field coils are former wound and are assembled in complete sets, Fig. 5. After all holes have been drilled in the shell a set of windings is taken, four poles inserted and the whole then slid inside the shell. The assembly is then placed over an expanding mandril which forces the poles tightly against the inner machined surfaces of the shell, forming a good magnetic contact. While in this position the screws are inserted through the shell and tightened up with a machine screwdriver. The accuracy of the grinding and this method of assembling are such that a truly circular tunnel is obtained without further machining. Plug gages are used after this operation before passing on to the armature department.

When complete all units are tested for grounds and shorts in the fields, commutator and armature windings. Motors are then given a long free run at a very high speed, after which comes a second test for possible shorts. Finally, motors are taken at random from the output and given brake tests. Generators are first given a test run of half an hour in which all regulator and brush adjustments are made. This is followed by a long run, each generator with individual battery and lights exactly as on the car, the speed being frequently changed over a wide range.

ACCESSORIES

Diamond Drip-Proof Carbureter

TWO new, and extremely ingenious features, are to be found in the Diamond carbureter. The main design is on a simple, approved principle with a lifting valve to control the mixture. As is seen in the illustration, this valve controls both air and fuel passages as it has a metering pin *A* attached which varies the nozzle orifice as the valve rises or falls. At starting the whole of the air passes downward in the central well and then up through the hole pierced through the middle of the valve. When the engine picks up speed the valve lifts and the air stream then divides, so that the velocity of air actually passing the nozzle does not vary much. The metering pin lifts with the valve and thereby increases the size of the jet, calculation so proportioning the size of the pin as to secure a constant ratio between the air and gasoline admitted.

When idling, or when starting with the strangler closed, gasoline collects in the bottom of well *D* around the foot of the nozzle and the air bubbles through and provides a whiff of very rich gas to give acceleration as the throttle is opened up. This feature is well shown by demonstration which the makers are giving on an old Ford, exhibiting a great ability on high gear in heavy traffic.

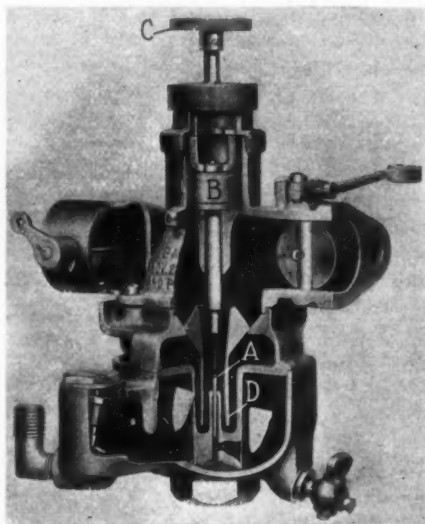
Graphite Dashpot

To steady the action of the valve a dashpot is needed, and a common fault of such dashpots is their tendency to stick. The inventor of this carbureter has hit upon the happy idea of using a solid block of graphite for the plunger *B* which is therefore everlastingly self-lubricating. Another clever feature is that the carbureter cannot leak or drip, as there is no outlet or intake below the level of the throttle. With an air pipe securely attached the carbureter will even operate under water. There is only one adjustment, this being on the metering pin and a control goes from the screw cap *C* to the dashboard.

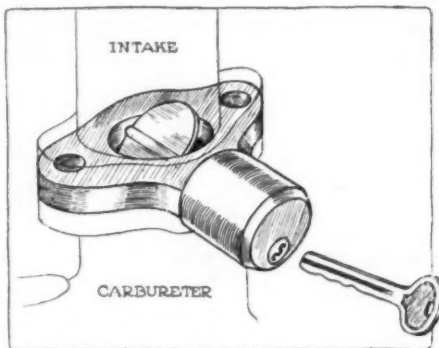
Being a simple manufacturing proposition the carbureter is sold for the low price of \$12.50, and it is made in sizes to suit cars of different make.—Diamond Carbureter Co., Jersey City, N. J.

Parkin Auto Lock

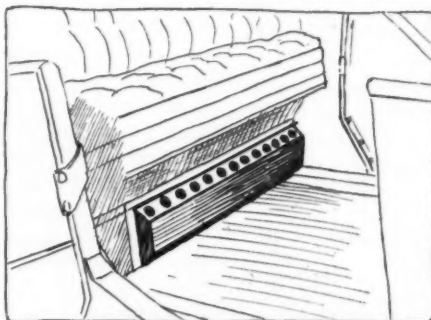
A new type of lock which places a shutter in the intake manifold when it is desired to prevent the car from being used is put out under the name of



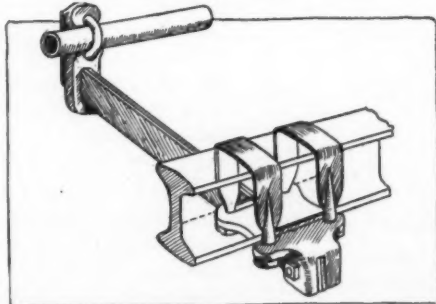
Diamond drip-proof carbureter



Parkin Auto Lock for intake manifold



Auto-Rad car heater mounted under seat



Litl Sho-Fur steerer for Fords

Parkin. The lock takes the position of a gasket between the carbureter and manifold flanges. In it is a butterfly valve which can be locked across the passage, thereby preventing the flow of gas into the motor. Each of the locks is different mechanically and there is no master key. The carbureter can be removed at any time without interfering with the lock. There is also a combined unit of lock and manifold on the market which can be purchased if desired in this form.—Parkin & Son, Philadelphia, Pa.

Auto-Rad Car Heater

A radiator for heating the automobile has been brought out under the name of Auto-Rad. The makers claim that the exhaust of an ordinary 40-hp. motor would heat an eight-room house, and there is no reason why a portion of this should not be taken for making the car comfortable in winter. The radiator consists of an enameled steel casing inclosing the radiating surface, thus permitting a circulation of warm air around the feet and under the body. The weight is given by the manufacturers as 4 lb. The upkeep cost for fuel is nothing since the exhausted gas which would otherwise pass out into the atmosphere is simply led through the radiator. Since the radiator is gas-tight the device is clean and odorless. The price of the device is \$6.—Brevendo Mfg. Co., Rochester, N. Y.

Litl Sho-Fur Ford Steerer

To bring the wheels of a car with reversible steering gear back in line the Litl Sho-Fur has been designed particularly for use on the Ford car. As shown by the illustration, it can be attached to any model T without machine work or without boring a hole and can be put on the car in 10 min. It is attached to the front axle of the car by two strap bolts. The means used for bringing the wheels back into line is a two-leaf spring of tempered steel. This passes through an eye clamped on to the tie rod and when this is moved to either side the spring tends to return to its center and bring the tie rod back to its normal position. The price of the device is \$3.—White Mfg. Co., Cincinnati, Ohio.

Stewart Duplex Carbureter

To meet the demands for eight- and twelve-cylinder motors the Stewart Duplex carbureter, which is in reality two carbureters in one, has been designed. The principle of the single Stewart carbureter is followed, but all the essential elements such as the metering pins, metering valves, mixing chambers, throttles, and adjustment are all separate. In order to obtain uniform results in both sides of the V, this duplex model is so arranged that the throttle and adjustment can be perfectly synchronized thereby equalizing the two motor sets.

The only function which is the same for both sides of the carbureter is the float bowl and the mechanism which keeps the gasoline at a constant level. There is also a single air intake port which works from a single hot air tube and stove on the exhaust manifold.

The Duplex carbureter is illustrated in the sectional view. The carbureter operates on a metering principle which can readily be understood from the illustration. With the motor at rest the main air passages are closed because the air valves *A* rest on their seats. As soon as the engine starts to rotate a vacuum is formed lifting these valves from their seats admitting air and drawing gasoline through the aspirating tubes *B*, a small amount of air is drawn through the primary air passages and up around the flared top of the aspirating tube. This flare on the end of the tube is for the purpose of spreading the gasoline in a film in which condition it is picked off the rim by the air which passes this point at a high rate of speed.

Only One Adjustment

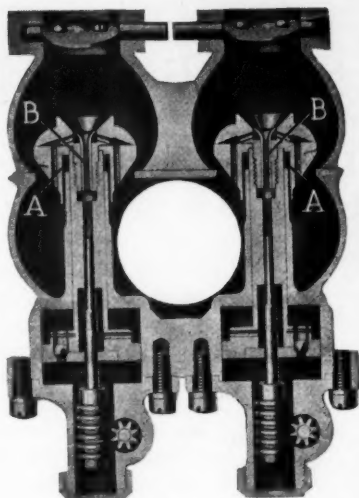
The more the throttle is opened the more the air valves will lift and the more gasoline will be allowed to pass by the tapered metering pins. The higher the valves are lifted the greater will be the opening around the metering pins, thus increasing the gasoline supply. The only adjustment possible in this carbureter is that of the relative position of the metering pin to the opening in the bottom of the aspirating tubes and when this is once made, it should be permanent.—Detroit Lubricator Co., Detroit, Mich.

Magnalite Alloy Pistons

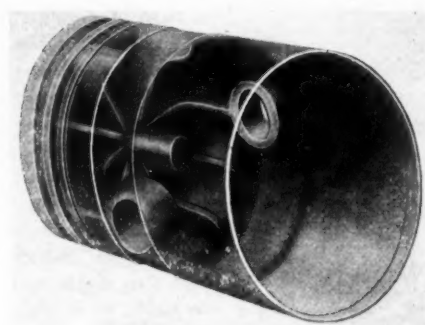
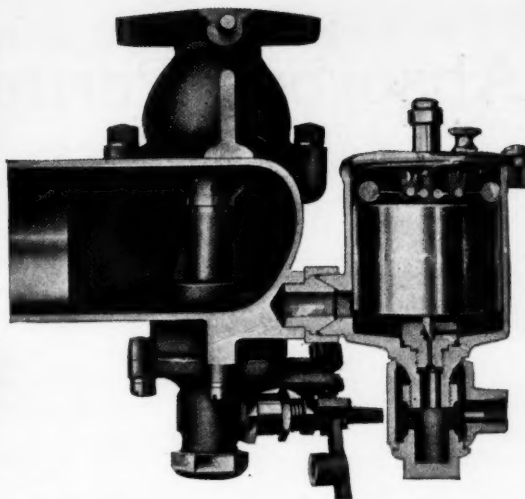
Aluminum alloy pistons have been much in the public mind of late especially in the automobile engineering world. Among other advantages planned for Magnalite pistons are less vibration and a cooler motor, the aluminum alloy used in their construction being lighter than aluminum and stronger than cast iron. The light weight minimizes vibration and the higher conductivity effects a quicker transference of the heat to the waterjacket. These pistons are manufactured to fit all cars. The rings used may be of either Magnalite or the ordinary cast iron type.—Walker M. Levett Co., New York City.

Guardian Robe Lock

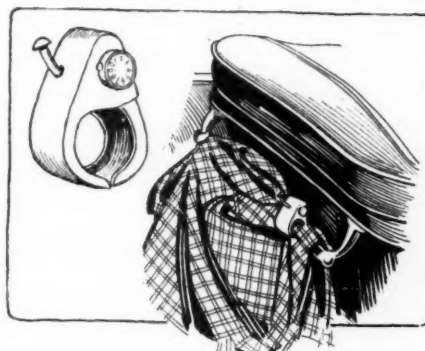
For locking the robes on a car which is abandoned by the driver temporarily, a combination device has been brought out whereby these can be clamped to the robe rail without danger of removal except by tools. It is intended to prevent the theft of robes, raincoats, grips, gloves, dusters, packages and other articles from the car and also eliminates



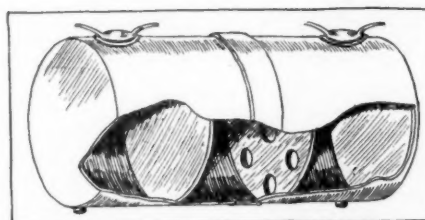
Two views of the Stewart Duplex carburetor which is really two carbureters in one



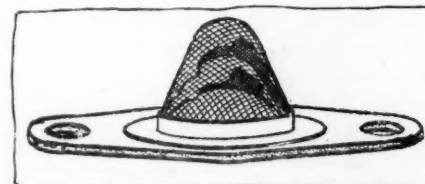
Magnalite piston, showing ribbing system



Guardian robe lock, showing one way to use it



Jasco partitioned tank for speedsters, etc.



Gasco gasoline economizer for intake manifold

the necessity of dragging the robes into the restaurant or home when the car is stopped.

The Guardian lock operates by combination, thus obviating the necessity for a key which can be lost. There is no ratchet on the lock and it can be closed in any position. The device is $3\frac{3}{4}$ in. high by $2\frac{1}{4}$ in. wide when closed. The jaws which clamp over the robe are $1\frac{1}{4}$ in. wide. The lock is made of heavy sheet steel nickel plated. The price of the device is \$1.—Mechanical Products Co., Cleveland, Ohio.

Jasco Tank Improvements

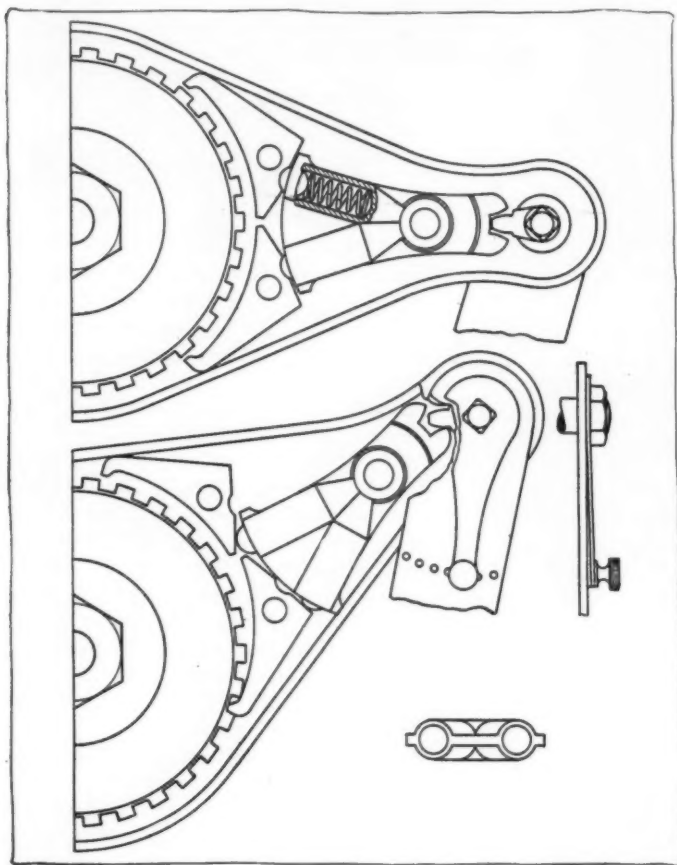
Several new features have been incorporated in the Jasco line of seamless drawn steel tanks. A rectangular tank has been added to the stock, and may be had with rounded or concave ends; a special square Packard tank, is supplied 12 by 14 by 32, holding 21 gal., and ready for installation, having all fittings. The price is \$20, or, with gasoline gage, \$23. A cylindrical tank is built for roadster, speedster or racing cars with a separate compartment in one end for oil and a splash partition in the middle of the gasoline compartment; these tanks are made in 14, 16, 18, 20 and 24-in. diameters and any length.—Janney, Steinmetz & Co., Philadelphia and New York City.

Gasco Gasoline Economizer

In order to more perfectly vaporize the fuel a device under the name of Gasco is being marketed which is placed in the manifold-carbureter connection. The Gasco device contains a set of screens intended to break up the globules of gasoline drawn from the carbureter. Another function of the screens is to prevent inflammation due to backfire as the screen will act in the same way as in a miner's lamp. The Gasco can be secured in any size, the prices ranging from \$1 to \$1.50.—The Gasket Supply Co., Philadelphia, Pa.

Absorber Permits Limited Free Motion

Device Invented by Lancaster Man Utilizes Ratchet and Pawl To Introduce Resistance to Violent Spring Action



Figs. 1-2—Shock absorber in normal position with pawls disengaged; shock absorber after obstruction is encountered with lower pawl engaged

A NEW shock absorber has been brought out in which the designer has endeavored to produce a device which will not offer any resistance within a certain amount of spring action. This permits the car to pass over smaller obstructions and depressions without any interference with the natural spring action. Beyond this range the action of the spring is checked in proportion to the severity of the depression or obstruction in the road. The inventor is E. H. Kreider, of Lancaster, Pa.

Uses Ratchet and Pawl

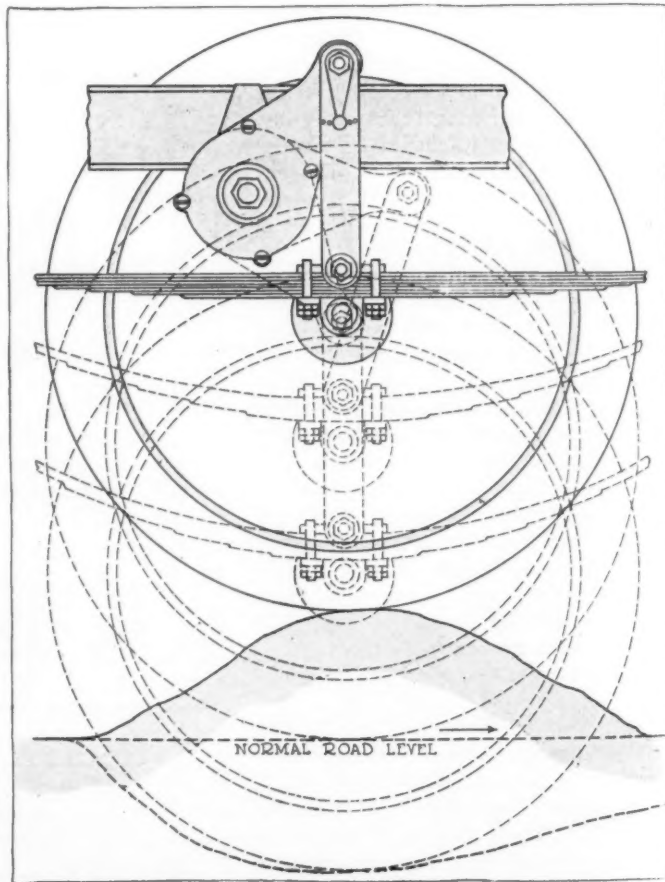
The means provided to accomplish this result are shown in Fig. 1 where it will be seen that the pawls of a ratchet and pawl action are both disengaged from the ratchet wheel and remain so for a limited amount of axle movement. When an obstruction higher than the above limit is encountered, the device, which is attached to the body of the car, will turn upward as in Fig. 2 and automatically drop the lower pawl into the ratchet, turning the ratchet wheel against resistance during the recoil movement of the spring. This prevents the up-throw of the body.

Assuming that the car has again taken its normal position with both pawls out of mesh and the wheel encounters a depression in the road, the wheel and axle will drop quicker than the body and thereby cause the shock absorber to turn downward when the upper pawl will engage the ratchet and

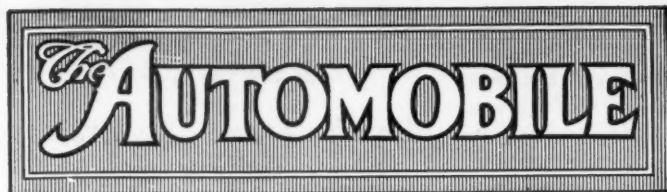
at the time the body tends to drop, an upward pressure is exerted by the shock absorber. Thus in either case whether the car encounters a depression or an obstruction, the shock absorber is designed to adjust itself without resistance and only comes into action on the return movement.

As will be seen by Fig. 3, the greater the obstruction or depression, the more the device comes into action, that is if it requires 50 lb. to move the device at a point near the neutral position, it will require almost 100 lb. to move it when on a high obstruction or deep depression. This is brought out in Fig. 3, showing the shorter leverage at the extremes in a case of depression or obstruction at the extremes.

Assuming again, that the road conditions are such that the car has a tendency to rock up and down a number of times in succession and with such violence that the shock absorber will move beyond the free action space both ways, the pawls are so designed as to remain engaged across the neutral space and cause the device to act constantly until the body of the car again settles down to its normal position at which time both pawls again drop out, permitting free action of the springs as before. The index pin and latch shown at Fig. 4 is for the purpose of changing the position of the neutral space to compensate for various makes of cars and also for light and extremely heavy loads.



Figs. 3-4—The greater the obstruction or depression the more the device comes into action. This is brought out in the above illustration which shows the action of the device on encountering a large obstruction above the normal road level and also a depression



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The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October 1903, and the Automobile Magazine (monthly), July, 1907.

Winter Driving

IF a national propaganda results from the resolution of the National Association of Automobile Accessory Jobbers to boost winter driving, every branch of the automobile industry will benefit. The car owner will benefit by the elimination of the idea that the automobile is merely a warm weather utility and will get nearly twice as much use out of his car. The manufacturer, the dealer, the garageman and the jobber will benefit because the industry will be more uniform in its demands the year round, rendering production and sales less a matter of seasons, and tending to straighten out the undesirable fluctuations of the demand and supply curve throughout the country, while the dead storage problem will be minimized. Such a condition may seem Utopian and at present unattainable, but results do not come without effort and the benefits involved are of such magnitude as to be worth every effort to attain them.

An editorial in THE AUTOMOBILE for Sept. 16, entitled The All-Weather Car, pointed out the increasing tendency of car owners to take advantage of the all-weather bodies for keeping their cars in active service during the cold weather when they have formerly put them in dead storage. The dealers report a steadily increasing demand for this type of car and, in fact, it would seem that conditions are auspicious for the launching of a boom for winter driving.

Automobile History

THE automobile industry in America has a history little understood not only by the masses owning automobiles but understood very little by several of the oldest pioneers, those who lived through the days of 25 years ago when the earliest efforts were being made. These pioneers are with us to-day, but so busy have they been in working out their own problems of design, manufacture and merchandising that they have had no time to pick up and bring together the threads of early endeavor.

This week THE AUTOMOBILE publishes the opening chapter of its History of the Automobile Industry in America, a work that has been in preparation for several years and on which much searching has already been done to lift the cover from early efforts before those who did the work have passed into the great beyond of forgetfulness. Although much has been gathered, much still remains to be told of a tale that stands without parallel in America. No other industry is more deserving of having its early efforts laid bare, and now that an industry with a manufacturing life of scarcely twenty-five years has attained such world-wide importance it is imperative that its development be accurately recorded.

Hotchkiss Drive

STUDY of the new chassis that have been described in THE AUTOMOBILE during the past six months shows that the Hotchkiss drive is distinctly on the upward trend in popularity. Commencing with small cars it is now being adopted for larger vehicles and is even making steady progress in the truck field.

Now, if it is satisfactory practice in a truck to take drive and torque stresses on the springs, there should be no doubt about the efficacy of the system for passenger cars; for the stresses in a truck are far heavier than in any lighter vehicle. There is much to be said on both sides, and the protagonists of torque and radius rods have much of the engineering theory in their favor, but in practice the advantage of simplicity ranks very high.

Trucks and Food

THE decision of the British government to withdraw the 33 1/3 per cent import duty on commercial vehicles will be of real assistance both to manufacturers in America and to consumers in England. From the British viewpoint it is important above everything else that the wheels of industry should run smoothly, and a plentiful supply of motor trucks has become a vital necessity to almost every trade; how vital has only been realized at the full in England since war absorbed the automobile equipment of industry throughout the United Kingdom.

A free supply of inexpensive trucks will prevent rise in price of almost everything that has to be handled in small quantities, especially foodstuffs, and had the tariff been maintained it would, after the war is over, have retarded the return to normal prices of all sorts of articles.

British Exempt Trucks from Tax

Englishmen Intervene to Free American Commercial Cars from 33 1/3 Per Cent Duty

LONDON, ENGLAND, Oct. 15—The order of Chancellor of the Exchequer McKenna, imposing an import duty of 33 1/3 per cent on all foreign cars has been modified to exempt trucks and truck parts. This was brought about by an immediate storm of protest not by American manufacturers but by Englishmen who have learned the value of American trucks at this time. It was brought out that American trucks have been of great advantage to the armies of England and to merchants whose trucks have been commandeered for use by the British army.

Robinson Leaves Case

RACINE, WIS., Oct. 23—Richard T. Robinson, for many years secretary of the J. I. Case T. M. Co., Racine, Wis., has resigned and will move his residence to California. He is succeeded by W. F. Sawyer, who has been associated with the Case company for fourteen years and until now was manager of the sales department. Ellis J. Gittings succeeds Mr. Sawyer and R. B. Coleman is promoted to manager of the collection department. Mr. Robinson is one of the founders of the Case company. Thus far the company has made no announcement of the election of a general manager to succeed F. Lee Norton, who retired a short time ago.

New Era Touring Car \$660

JOLIET, ILL., Oct. 23—Among the companies to enter the field for the first time with a car for 1916 is the New Era Engineering Co., this city, its product being the New Era touring car to sell at \$660. The power plant is a four-cylinder 3 1/4 in. by 4 1/2 in., is block cast, the cylinders being integral with the upper half of the crankcase. Gear reduction is 4 1/4 to 1.

Cooling is obtained by the thermo-siphon system, ample space for circulation of water being allowed on all sides of the valve chambers, while several openings are provided between the cylinder proper and the cylinder head to eliminate as far as possible any restriction in the flow of water. A combined pump and splash lubricating system is used while the fuel supply is from a gravity tank located under the front seat, where it is readily accessible.

The electric starting and lighting system is an Allis-Chalmers, operating through a silent chain. The gearset is

in a unit with the motor and is of the three-speed selective type. The gears are heat-treated chrome nickel steel and run on double rows of Hess-Bright bearings. Left drive and center control is furnished for domestic trade or right drive for export trade.

The clutch is a Raybestos-lined multiple disk dry-plate type. The rear semi-floating axle is fitted with chrome nickel steel shafts and Hyatt roller bearings. Service brakes are of the contracting band type and the emergency expanding bands inside the drums. An Atwater Kent ignition system with automatic spark control is used.

Overland Elects Officers—Earl a Director

TOLEDO, OHIO, Oct. 26—C. A. Earl was elected a director and one of the vice-presidents of the Willys-Overland Co. at the annual meeting of the stockholders this afternoon.

The following directors and officers were re-elected: President, J. N. Willys; vice-presidents, Isaac Kinsey, O. S. Jameson, H. L. Shepler, H. T. Dunn; secretary, R. R. Scott, and treasurer, Walter Stewart. Representatives of 165,000 shares of common stock voted.

Treasurer Stewart in a general report to the stockholders said: "The financial condition of the Overland company was never so good as now. The company owes nothing on merchandise notes. Its indebtedness to its bank represents its only outstanding paper. It is taking advantage of all discounts for cash, and its average cash balances for the last four months have been in excess of its total debts."

At the close of the stockholders' meeting the directors elected the following executive committee: J. N. Willys, H. T. Dunn, H. T. Shepler, C. S. Jameson, R. R. Scott and Walter Stewart.

New Chase Truck for \$1,650

SYRACUSE, N. Y., Oct. 21—The Chase Motor Truck Co., this city, has added a 1-ton model to its present line, known as model A. The new model will be a worm drive type with a four-cylinder unit power plant of the L-head type, 3 1/2 by 5 1/4. A few of the features are price of chassis in paint with cab, \$1,650; wheelbase, 140 in.; front axle, I section, rear, Sheldon worm drive; Holley carbureter; water-cooled; Bosch ignition; Brown-Lipe selective sliding gear, three-speed transmission, case attached to fly-wheel housing; weight on rear axle, 53 per cent; payload on rear axle, 83 per cent; fuel tank capacity, 18 gal.; oil tank capacity, 1 1/4 gal., and loading space, 8 1/2 ft. back of driver's seat. Electric lighting and starting equipment will be furnished at extra cost. Deliveries will commence Dec. 1.

French to Boycott Ford Cars

Manufacturers, Dealers and Owners Indignant at Anti-Loan Campaign

PARIS, FRANCE, *Special Cable to THE AUTOMOBILE*—French dealers have decided to boycott Ford cars from now onward and to do all they can to prevent their sale in France by making an appeal to the public to answer Henry Ford's notorious "tin can" utterance by shunning his car. The indignation created throughout France and England by Ford's anti-loan speeches is very great as shown in many letters to newspapers. It is probable that the sale of Fords, which has been very large in England and perceptible in France, will be reduced considerably for a time at least.

Morris Eckhart Heads Auburn

AUBURN, IND., Oct. 23—Following the death of Charles Eckhart, president of the Auburn Automobile Co., this city, Morris Eckhart has been elected president. F. E. Eckhart is first vice-president, J. I. Farley, second vice-president and sales manager, W. H. Denison, secretary, and F. B. Sears, treasurer.

I. H. C. Reduces Truck Prices

CHICAGO, ILL., Oct. 23—The International Harvester Co. of America has reduced the prices on four types of trucks, for loads of 1000, 1500 and 2000 lb., ranging from \$600 to \$1,500. Two new models have been added this year, one of 1500 lb. capacity selling for \$950 and a ton-truck the chassis of which sells for \$1,500.

Two six-story additions to the factory at Akron, Ohio, will double the present manufacturing equipment. The following list gives the new prices:

Model MA, 1000 lb., air-cooled.....	\$600
Model M, 1000 lb., water-cooled.....	710
Model E, 1500 lb., heavy-duty motor...	950
Model F, 2000 lb., chassis only.....	1,500

Saxon Incorporates in Delaware for \$3,750,000

DENVER, DEL., Oct. 27—The Saxon Motor Car Co. was incorporated in this State yesterday with a capital stock of \$3,750,000. The incorporators are H. E. Latter, N. P. Coffin, and C. M. Egner.

1000 Chevrolets for St. Louis

ST. LOUIS, MO., Oct. 23—The recently organized Chevrolet Motor Car Co. of St. Louis has arranged with the Chevrolet company of New York for the shipment to St. Louis of 1000 Chevrolet 4-90 cars between now and Jan. 1, when it is expected the local assembling plant of the company will be ready for operation.

Shortage of Gasoline in Paris

Fuel Famine for First Time Since War Began—Price Now 42 Cents

PARIS, Oct. 9—For the first time since the war began Paris has experienced a real shortage of gasoline. This week supplies have failed to reach the retail dealers, many of whom have ceased to supply customers, while others refuse to sell more than 1 gal. to any one person. The correct explanation of the shortage appears to be that vast supplies have been requisitioned at the various refineries by the military authorities. This is not surprising in view of the enormous aeroplane activities of the French, and the possibility of an advance, which will of course throw greater work on the automobile transport department. The recent attacks in the Champagne and Arras districts have been responsible for a great increase in gasoline consumption by reason of the thousands of trucks employed in carrying ammunition to the guns, in moving troops, and in clearing away wounded. It is obvious that the military authorities will lay hold of greater reserves than usual in view of the present attacks becoming general.

The average retail price of gasoline around Paris, excluding the city of Paris, where there is a special tax, is now 42 cents per gal. Some dealers are selling at 45 cents per gal. Three years ago the average price was 27 cents, and just before the war gasoline was sold round Paris at 33 cents. There has been no additional taxation during this period. Benzol, which was largely employed for commercial vehicles, taxicabs, and by manufacturers for chassis testing, has been unprocurable since the war, all supplies having been requisitioned for making explosives.

Michigan Service Managers Organize

DETROIT, MICH., Oct. 26—Service managers and other factory representatives from most of the automobile manufacturing concerns in Michigan and Northern Ohio met in convention here to-day and formally organized the Automobile Service Managers' Association of Michigan. Its principal object and purpose is to determine the best methods of conducting the work of the manufacturers service and repair departments, to furnish a maximum of service to the mutual advantage of all concerned, to improve and facilitate co-operation among manufacturers, dealers and owners and to promote the more liberal policy of help-

fulness to the purchasers of motor vehicles that is reasonable and equitable to all.

Among the cities in northern Ohio where automobile concerns are located and which are included in the new association, are Toledo, Bowling Green, Lima, Sibley and Fremont.

Cleveland has not been included on the list of manufacturing centers to be looked after by the new organization because it is generally thought that before long a service managers' organization will be started there.

Officers Elected

C. R. Lester, manager of the service department of the Packard Motor Car Co., was elected president of the association; E. V. Rippingale, Hudson Motor Car Co., vice-president; D. H. Haselton, Regal Motor Car Co., secretary and treasurer; H. G. Fitch, Willys-Overland Co.; J. L. Kenyon, Cadillac Motor Car Co.; Charles Gould, Maxwell Motor Co.; C. W. Matheson, Dodge Bros.; Pierre Schon, General Motors Truck Co., and A. O. Weise, Oakland Motor Co. were elected directors.

Kelly-Springfield Tire to Reduce Common Par to \$25

NEW YORK CITY, Oct. 27—At a special meeting the board of directors of the Kelly-Springfield Tire Co. adopted a resolution that the certificate of incorporation be amended so as to reduce the par value of the common stock from \$100 per share to \$25 per share.

A special meeting of stockholders will be held on Nov. 30 to act on the resolution. The par value of the 6 per cent cumulative preferred and the 7 per cent second preferred stock will not be reduced.

Payne Is Manager of Gibson Co.'s Automobile Department

INDIANAPOLIS, IND., Oct. 23—J. H. Payne has been appointed manager of the automobile department of the Gibson Co. Prior to his present connection Payne was manager of the small motor department of the General Electric Co.'s local sales organization.

Hayes Truck Wheel Co. Formed

ST. JOHNS, MICH., Oct. 26—The Hayes Motor Truck Wheel Co. has been organized in this city with a capital of \$100,000. Officers have been elected as follows: President, C. B. Hayes; first vice-president, N. S. Potter; second vice-president and timber manager, W. C. Morrey; secretary-treasurer and general manager, A. D. Smith, and superintendent, H. J. Keller. The company, which is occupying the factory of the St. Johns Manufacturing Co., expects to be in operation by Nov. 1, and a sawmill will be operated in conjunction with the plant.

Canadian Ford Melon

600 Per Cent Dividend—Capital Increased from \$1,000,000 to \$10,000,000

DETROIT, MICH., Oct. 26—At the annual meeting of the Ford Motor Co. of Canada it was decided to increase the company's capital stock from \$1,000,000 to \$10,000,000. A 600 per cent stock dividend to shareholders has been recommended to the directors. Six million dollars par value of new stock is to be issued to the present stockholders who will receive six shares for every share they now hold. Six million dollars will be transferred from the company's surplus fund to capital stock.

Net earnings of the company during the fiscal year 1915 amounted to \$3,200,000 in round figures and the surplus is about \$7,000,000.

The directors of the company were re-elected. They are: Henry Ford, James Couzens, Frank L. Klingensmith, Gordon M. McGregor and W. R. Campbell. The officers of the company now are: Henry Ford, president; Gordon M. McGregor, first vice-president, treasurer and general manager; James Couzens, second vice-president; Frank L. Klingensmith, third vice-president; W. R. Campbell, secretary.

Canadian Ford Stock Up

DETROIT, MICH., Oct. 26—Shares of the Ford Motor Co. of Canada which were quoted \$1,500 yesterday, were quoted \$2,000 bid and \$3,000 asked this morning on the local stock exchange. Some brokers predict that before the end of the week the stock will go up between \$500 and \$1,000 a share.

Canadian Ford to Expand

FORD, ONTARIO, Oct. 23—By Jan. 1 a new machine shop, 700 by 45 ft., and a foundry, are to be ready for occupancy by the Ford Motor Co. of Canada, Ltd. This will give employment to over 500 more men. Now there are 1920 on the pay-roll, 1730 in the shops and 190 in the offices. There are eight concerns located in Windsor, Ford, Walkerville or vicinity, making parts for the Ford cars, and they employ all told 1153 men. The sociological department of the Ford company has gathered information tending to show that 15,363 people living within the vicinity of the plant are either directly or indirectly being supported by the company.

Although this the dull season and the lack of material is still prevailing, the Canadian company's business is increasing in such a way that this season's output will be more than 35,000 cars.

Packard Surplus \$3,713,747.22

Gains \$1,915,926.80—Assets
\$21,814,153.71—29,936 Cars
and Trucks Built

DETROIT, MICH., Oct. 22—During the fiscal year ending Aug. 31, 1915, the surplus of the Packard Motor Car Co. was \$1,915,926.80 ahead of the total at the end of the 1914 fiscal year, totaling \$3,713,747.22 as compared with \$1,797,820.42 in the previous business year, or an increase of over 50 per cent. The total number of cars and trucks built by the company to Aug. 31 was 29,936, nearly 8000 being trucks.

The assets of the company were \$21,814,153.71 or \$3,850,533.09 or over 20 per cent larger than those of 1914.

Among the assets one of the items which shows the greatest increase is that for tools, the total amount credited to the account being \$1,194,101.65, or \$522,089.70 more than in 1914. This, of course, is due principally to the fact that the construction of sixes and fours has been abandoned and that entirely new tool equipment was needed for the making of the twelves.

The next item which shows the biggest increase is that of construction work, which has passed the \$500,000 mark while in 1914 it totaled less than \$17,000. The raw material account shows an increase of over \$1,000,000 totalling \$7,-

423,875.93. This includes not only the raw material, but also completed cars and work in progress on cars or trucks.

The investments of the company in stocks, bonds and short time securities have been very heavy in 1915, this account showing an increase of over \$1,100,000 as compared with 1914.

While the cash account for vehicles in transit to dealers is over \$200,000 lower for 1915 than for 1914, the account as to cars in transit to branches shows an increase of over \$310,000.

Among the liabilities the item most conspicuous is that of accounts payable and which means or represents such accounts as accrued payroll, current invoices, not due, deposits on vehicle orders, etc. The total for the past year is \$2,335,907.57, or \$1,449,126.58 over 1914.

Beal with Marmon

INDIANAPOLIS, IND., Oct. 23.—W. A. Beal has taken a position with the Nordyke & Marmon Co. as traveling representative. Mr. Beal is well known in the automobile selling trade through his connection with the Stevens-Duryea Co. since 1911, first as Pacific representative with headquarters at San Francisco, and later in charge of outside territory between Kansas City and Chicago branches.

Moon Buggy Builds Roadsters

ST. LOUIS, MO., Oct. 22—The John W. Moon Buggy Co. of St. Louis has submitted a bid for the delivery of 500 roadsters in New York for shipment.

Packard Motor Car Co.'s Balance Sheet for 1912, 1913, 1914 and 1915

	ASSETS	1912	1913	1914	1915
Real estate, at cost.....	\$	285,312.49	\$ 285,460.21	\$ 285,864.21	\$ 370,047.88
Buildings		2,084,865.81	2,063,784.48	2,140,259.05	2,082,763.21
Machinery		1,145,381.22	1,137,276.24	1,094,754.36	1,464,294.68
Equipment		1,041,459.64	1,039,491.08	979,774.36	982,534.32
Fixtures, including office furniture.....		245,756.15	290,041.89	307,475.94	327,656.49
Tools		250,000.00	250,000.00	672,011.95	1,194,101.65
Construction work in progress.....		30,803.34	14,025.38	16,881.81	521,388.31
Development—Drawings, patterns, models, etc.		138,000.00	180,870.00	342,438.58	429,443.63
Rights, privileges, franchises and inventions..		1.00	1.00	1.00	1.00
Investment in branch selling companies.....		1,446,079.02	1,481,893.61	1,515,288.87	1,916,225.16
Raw material, work in progress and finished vehicles		5,351,217.23	8,136,024.99	6,394,864.56	7,423,875.93
Stock option contracts with employees.....		112,200.00	42,500.00	201,950.00	186,200.00
Investments in stocks, bonds and short time securities		38,232.50	38,232.50	248,462.50	1,385,387.50
Cash		1,030,513.95	1,374,951.12	2,462,464.45	2,289,111.43
Vehicles in transit to dealers.....		340,090.27	191,724.05	279,308.26	53,102.95
Vehicles in transit to branches.....		672,136.23	411,761.32	263,146.11	577,306.29
Accounts receivable		132,290.80	187,708.20	138,196.16	137,288.92
Bills receivable		188,095.03	60,261.16	55,893.61	33,500.00
Expense paid in advance.....		130,864.18	153,840.87	97,083.81	94,924.36
Bills receivable from branches.....				467,500.00	345,000.00
Total		\$14,663,298.86	\$17,339,848.10	\$17,963,620.62	\$21,814,153.71
*1912—Depreciation for current year deducted, aggregating \$1,230,485.85.					
†1912—Reduced by action of Board of Directors from \$3,274,958.89 to \$1.00.					
	LIABILITIES	1912	1913	1914	1915
Capital Stock—					
Common capital stock.....	\$	5,000,000.00	\$ 5,000,000.00	\$ 7,065,300.00	\$ 7,065,300.00
Preferred capital		5,000,000.00	5,000,000.00	5,000,000.00	5,000,000.00
Debt notes due Dec. 1, 1916.....		2,000,000.00	3,000,000.00	3,000,000.00	3,000,000.00
Accounts payable		1,175,710.33	1,154,874.94	886,780.98	2,335,907.57
Reserves—Accrued for interest, taxes, etc....		288,804.71	178,716.94	213,719.22	330,213.34
Deferred payments on real estate purchased for retail selling agencies.....					368,985.58
Surplus—After deducting all charges.....		1,198,783.82	3,006,256.22	1,797,820.42	3,713,747.22
Total		\$14,663,298.86	\$17,339,848.10	\$17,963,620.62	\$21,814,153.71

Note—Of the common stock as shown in the report for 1915, there are 70,653 shares outstanding and 9347 unissued.
Of the preferred shares, there are 50,000 outstanding and 30,000 unissued. Par value of both common and preferred shares is \$100.

Elcar Is 1916 Name for Pratt

Elkhart Carriage & Motor Co.
Is New Company Style—
Car to Sell for \$775

ELKHART, IND., Oct. 23—A change in both name of car and company marks the entrance of the former Elkhart Carriage & Harness Mfg. Co., this city, maker of the Pratt car, into the 1916 field. The car for 1916 will be known as the Elcar while the company's corporate name has been changed to the Elkhart Carriage & Motor Car Co.

The Elcar will be made in a touring and roadster model at \$775. The four-cylinder motor is of the high speed, high-efficiency, long-stroke type, having cylinders and waterjackets block cast, the cylinders measuring 3½ by 5 in. Much attention has been given to an effort to lighten all reciprocating parts and for the attainment a well-balanced power plant.

The lubrication system is a combination of the splash and force feed, a plunger pump operated by the camshaft, forcing oil through all the main bearings, while the connecting-rods are fitted with scoops by which oil is distributed to the cylinder walls and pistons. Thermo-siphon cooling in connection with a tubular radiator and fan is used.

The motor, clutch and gearset form a unit, mounted directly to the main frame at three points, the third point in front being a large bearing on a common center with the crankshaft. Three speeds are provided with center control. Gears are nickel steel, heat treated, with annular ball bearings. The clutch is a cone type with easy engagement springs under the facing.

The electric system is complete and self-contained, ignition being gained through a Delco distributor, while starting is accomplished by an Apco motor-generator operating through a silent chain inclosed in front of the motor gearshifts.

The wheelbase of the Elcar is 114 in. The full streamline effect is obtained in the Elcar, and the doors are wide with concealed hinges. Included in the equipment are one-man top, curtains and cover, windshield, electric lights and extra demountable rims and carrier and a full equipment of tools in both the five-passenger touring and roadster models.

New Billings & Spencer Co. Formed

HARTFORD, CONN., Oct. 25—At a meeting of the stockholders of the Billings & Spencer Co., held this morning, the stockholders ratified the recommendations of the board of directors to dis-

pose of the assets, good will and business in consideration of 12,000 shares of the new company at \$25 a share. The board of directors of the old company was also authorized to vote on the 12,000 shares of the new company in favor of the issue of 8000 additional shares at a par value of \$25 to be sold at not less than \$37.50, the right to subscribe being offered first to stockholders of the Billings & Spencer Co., and the price to be fixed by the directors of the new company. By vote of the stockholders the old company went out of existence.

Townsend Brings Out Tractor

BELOIT, WIS., Oct. 22—The Townsend Mfg. Co., Beloit, Wis., is bringing out a new gasoline tractor for general purposes in the city and on the farm. It is propelled by a gasoline engine rated at 10 to 20 hp. and is built in several types. The tractor may be used for plowing, seeding, cultivating and similar work as well as for filling silos, hauling farm loads, etc. The tractor in a recent test handled three 14-in. plows in sod which had not been plowed for forty years and which averaged 8 to 11 in. in depth. It was turned over at a cost of 11.2 cents per acre for fuel and 3.5 cents for grease and other lubricants.

Tower Truck in the Field

GREENVILLE, MICH., Oct. 23—R. J. Tower of this city is bringing out the Tower truck which is to be manufactured by a company to be known as the Tower Motor Truck Co. The first model was recently completed in the machine shop and foundry of Mr. Tower. It has a Continental four-cylinder block motor, 135 in. wheelbase and Timken axles.

New Continental Drop Forge Plant

MUSKEGON, MICH., Oct. 22—Work has been begun on the construction of the new drop forge plant of the Continental Motor Manufacturing Co. A building 60 by 180 ft. will be erected on half of property fronting on Muskegon Lake, the site having been recently purchased, and the other half of the site will be kept open for future building operations.

Toledo Firms to Enlarge

TOLEDO, OHIO, Oct. 22—Nearly \$300,000 will be spent immediately on extensions of two local makers. The Toledo Machine & Tool Co., will build a three-story addition costing \$200,000 to be 400 by 100, of steel, brick and concrete construction. The new structure will increase the plants capacity 35 per cent.

The Electric Auto-Lite Co. has broken ground for a \$74,000 addition to its Champlain Street plant. It will be 385 by 103, three stories and of concrete and steel construction. The plan provides for a fourth story.

Record Year for Locomobile

Truck Orders Large—Domestic Business Shows 12% Gain Over Last Year

BRIDGEPORT, CONN., Oct. 25—Due to the war the Locomobile Co. of America has enjoyed the most prosperous year in its history. Although officials of the company are reticent when questioned about war orders, it has been learned from an authoritative source that nearly 700 trucks of the 3-ton type have been shipped to the Allies, in addition to 100 pleasure cars for the Russian army, a special car for the Grand Duke Nicholas, and 140 pleasure-car chassis for the Russians. The latter will be equipped with soup kitchens.

It was announced to-day that with the year ending Aug. 31, the domestic business had shown a 12 per cent increase over last year, practically all passenger car trade.

Increase in the Locomobile company's business has meant much to other Bridgeport industries which were more or less affected by the tariff regulations. The Locomobile company has divided a great deal of its work among Bridgeport factories, principally the foundries.

Six Entries to Date for Sheephead Meet

NEW YORK CITY, Oct. 27—Six entries for the 100-mile invitation race for the Harkness gold cup have been made to date for the Sheephead Bay Speedway meet on Election Day as follows: Resta, Burman, Aitken and Mulford, in Peugeots; Rickenbacher, Maxwell, and De Palma in his Mercedes. De Palma, it is expected, will get his car into shape for the race. The trophy is open only to drivers who have won big races this year and is to be the object of competition annually. A gold miniature of the cup will be presented to the winner on Election Day.

Burman in his Blitzen Benz, will try to make a lap in a minute or less, or at the rate of 120 m.p.h. Juan Domenjos will make several flights in his aeroplane and several flights will be made by Frank Goodale in the Stevens dirigible.

Prince Paul Troubetzkoy is planning to race President Harkness in a match race at the track on that date.

New Six-Story Addition for Brown-Lipe-Chapin

SYRACUSE, N. Y., Oct. 26—The Brown-Lipe-Chapin Co., this city, has begun an enlargement of its plant which will give it at least 50 per cent greater capacity and will involve an expenditure of

\$750,000. The factory structure upon which work is now under way is to be six stories, 190 by 70 ft., and will be built of reinforced concrete, corresponding in exterior appearance with the main building erected six years ago.

Extension of the case-hardening plant, to be made at once, will be in proportion to the general plan of doubling the entire plant capacity. Five months are allowed for the completion of the six-story addition.

More than 1600 persons are employed in the factory and office of the company. After the addition is finished at least 500 more will gradually be placed on the pay-roll.

With the plant capacity doubled, it will probably be possible to do away with night work. For several months the plant has been operating 24 hr. a day.

Splitdorf Plans 75% Expansion

NEWARK, N. J., Oct. 18—The Splitdorf Electrical Co. has adopted plans for additional factory facilities in the shape of a new building 300 ft. long by 50 wide and six stories high, to be erected adjoining the present main factory in this city. It will be built of brick, and will increase the present plant space 75 per cent or about 100,000 sq. ft.

The new factory is expected to be finished within six months and will contain much additional equipment.

At the present time, the output of magnetos is 1500 a day, but plans contemplate an output of 2000 a day by next spring when the new building is completed. There are 1500 employees in the main plant, 300 in the Sumter, 300 in the Apple and 200 in the third plant.

May Forbid Starting Engines Before Ferry Docks

NEW YORK CITY, Oct. 21—Ferry companies in this city are being fined \$500 for each offense by the United States Government for allowing automobiles to start their engines before the boats are actually tied up in their slips. Under the Federal law governing ferry boats the companies may refuse to permit an automobile on any of their boats until the gasoline tanks are emptied, and it is stated that if the drivers of cars continue in violating the law by running their engines, the ferry companies will enforce the last named one in regard to the use of gasoline.

Dingley to Undergo Operation

LOS ANGELES, CAL., Oct. 20.—Bert Dingley, the veteran race driver and well-known automobile man of this city, who was injured in the wreck of the Ono car on the Tacoma speedway, July 4, 1914, has returned to the Tacoma General Hospital to undergo another operation in an effort to save his foot.

Co-operation the Slogan Brought Out at Electric Vehicle Assn. Convention

To Develop Business All Must Pull Together—
Central Stations Must Do Their Share, Especially
in Promoting Sales of Electrics for Municipal Work

CLEVELAND, OHIO, Oct. 22—Reviewing the work of the sixth annual convention of the Electric Vehicle Association of America, which closed here to-night, the outstanding feature was the plea for co-operation between the various branches of the industry. It was recognized that in order to develop the business and make it grow, all who are in any way interested in it must pull together. Competition with other classes of motor vehicles was taken full account of, and petty differences within the industry must be forgotten.

That the central station is a big factor in the promoting of the industry was most strongly emphasized, and while it is not expected that the central station interests will do more than their share in the developing of fields for electrics, the manufacturers expect them to at least do their part. As to the selling of electrics for various municipal work, such as fire, police, ambulance, street cleaning and other service, the central stations were pronounced the one big factor, for it is through their interests that the city officials can be properly approached and influenced.

The electric taxicab came in for a great deal of interest, as well as the light delivery electric, for which there is very evidently a big field.

Close Relations with N. E. L. A.

Along the line of co-operation, the association formally voted to get into closer harmony with the National Electric Light Association, which is a very strong organization in its field. It was immediately realized that the interests of the two organizations are very closely allied, and that each can help the other. Hence the convention instructed its incoming officers to do all they can to promote a close relationship, with possible affiliation with the N. E. L. A. as the goal. There was strikingly little dissension from this future plan.

One other point on which great emphasis was placed was as to the selling of electric commercial cars in fields for which they are best adapted, and not trying to force them in cases where it is a well-known fact that gasoline types are better. There is a distinct field for both the electric and the gasoline truck, it was insisted, and it is a big mistake to try to sell on other than scientific lines. The first step in a sale is to analyze the transportation problems involved and then to be assured that the machines will

pay. Unsuccessful installations are bad advertisements and do not promote additional sales.

That electric garage service is not at all satisfactory at the present time was brought out. The makers and central station men feel that the trouble is largely along this line, for people must be assured of good and efficient care of the vehicles else they will not buy. The properly equipped electric garage, in fact, is positively necessary to the development of the electric vehicle industry.

Nearly 300 in Attendance

The attendance ran close to 300, and a good proportion were central station men. There were eighty-seven central station operators on hand, fifty-two battery men, forty vehicle manufacturers or their representatives, sixty-five electric accessory men and forty-five having miscellaneous connection with the industry.

The registration records showed that the gathering was by no means from any one section of the country, nearly all large cities being included. For instance, an unofficial count showed that there were fourteen from New England, ten from Philadelphia, sixteen from Detroit, two from Los Angeles, fifty-one from New York City, and one or more from many other localities. Naturally, due to convenience, many of Cleveland's electric men came, the total from the city being 115.

The convention elected as officers for the coming year four who are connected with current producing companies, two who are members of electric car manufacturing businesses, and one identified with an electric engineering concern. W. H. Johnson, vice-president of the Philadelphia Electric Co., Philadelphia, was made president. Other officers are E. S. Mansfield, Superintendent Operating Bureau of Accounts, Edison Electric Illuminating Co., Boston, vice-president; H. M. Edwards, auditor, New York Edison Co., New York, treasurer; W. H. Blood, Jr., Stone & Webster Management Assn., director; P. D. Wagoner, president, General Vehicle Co., Long Island City, N. Y., director; G. H. Kelly, secretary-treasurer, Baker, R. & L. Co. Cleveland, director, and the retiring president of the association, J. F. Gilchrist, vice-president, Commonwealth Edison Co., Chicago, director.

Although no statement was made rela-

tively to these selections, which were voted unanimously by the convention, it is probable that the central station people were made vitally interested in the association in this way in order to cement their co-operation with the manufacturers more and more.

Convention in Detail

Following the welcoming of the delegates to the City of Cleveland by Bascom Little, president of the Cleveland Chamber of Commerce, the convention got under way with the address by President J. F. Gilchrist. He said in part:

"It may be said that the work of the Association this year has been consistent and persistent, rather than spectacular. A great deal of attention has been given to the accumulation of data and information useful to the members, and equal attention has been paid to publicity of value to the industry in the shape of articles prepared for the information of the general public. The membership has shown a very good growth during the year.

The national highways were also favored by Mr. Gilchrist. "While we may not all consider the electric passenger car a touring car at the present time," said he, "nevertheless, we should all, I believe, take an intelligent interest in the great national highways. Do not forget that the use of these highways may be found very important for commercial electric vehicles.

"The year has witnessed a considerable development in the various plans for selling electric vehicles without batteries," he continued, "giving battery service on some rental or battery exchange plan. It is perhaps too early to express an opinion as to the ultimate result of this movement. It is most important, and I do not hesitate to say that some plan of this sort must be worked out to a successful conclusion before the electric delivery wagon or truck is to be regarded as an entire success for the use of the small merchant. The large user has a great success with the electric wagon at the present time, but it seems to me that we must certainly extend a helping hand to the small user in the matter of battery maintenance.

The Garage and Rates Committee reported that early in this year a meeting was held in Chicago to which the representatives of all of the commercial vehicle manufacturers having offices in that city were invited. At this meeting the representatives expressed an unanimous opinion that:

1. A battery service system would make it possible to increase their sales 100 per cent in the district where a suitable service was available.
2. If the battery service could be rendered through independent reliable garages it would be preferable.
3. That more sales effort must be spent

on prospects. At present in this district there are thirty gas truck salesmen to one electric.

Recommend New Sign

This committee has recommended a new sign which measures 24 in. across and has a blue background with a red cross-bar and letters of white. The wording is "electric charging station."

C. E. Smith of the Walker Vehicle Co. spoke on the results so far attained and the experience gained by his company by the new scheme which the concern has adopted in Chicago of renting batteries, selling the cars without them and at a reduction. He outlined the plan of giving the electric garage dealer the benefit of the battery plan, and said that it has been a great stimulation to sales of these cars in the Chicago territory. It enables them to sell the cars at a lower first cost, and then there is a fixed monthly rate for battery rental and charging.

W. H. Conant asked if there are any mileage limitations on the scheme, or where the car is run, or who operates it. He also wanted to know if the condition of the car made any difference in the rental charge. His idea is that the contract should not ignore accidental injury, nor should there be a definite rate for current when cars are run so differently as regards total distance by different people. He questioned as to who is responsible if the car is damaged and the battery hurt, and wondered if it is good business to sell an article of a definite life on a partial or deferred payment plan.

Central Station Co-operation

The report of the committee on central station co-operation was received with a great deal of enthusiasm by the convention, dealing as it does with a subject so vital to the interests of both manufacturers and those who supply current.

George H. Kelly had no written paper to present in attacking his subject of the "Problems We are Facing and How They May Be Met," but he electrified the convention with some most appropriate and rapid-fire extemporaneous logic.

Co-operation Is Better

The past year has shown marked development in the co-operation between the different branches of the electric vehicle industry, Mr. Kelly stated. There are two questions before the industry. One is the creating of a demand, and the other is how to care for the cars after they are sold. The electric car of to-day is a vehicle of utility and service, and not to do stunts with, he said. For city use, the electric answers the question of transportation and utility for 99 per cent of the users to-day. Its possible speed is in excess of the speed limits of any city in the country, and its mileage is greater than anyone requires. The

people, according to Mr. Kelly, are beginning to realize more and more that the electric is a preeminent town car.

He says that the big problem is how to prove this to the great majority of the people, and he believes that educational publicity is best. But the members of the industry must be absolutely convinced themselves first. If there were enough of the vehicles manufactured absolutely sold on the great saving of electric trucks, and they would convince the buying public, there would not be enough electric truck makers to meet the demand.

Care A Problem

The other big problem is the care. Mr. Kelly says all must admit that the electric car is unable to get the expert care that the gasoline vehicle can get to-day. In order to be assured of proper electric care, one must go to an educated electric man. There are not over a dozen electric garages of merit in Cleveland, for instance, while there are over 150 gasoline garages, according to Mr. Kelly. It is easy enough to sell the cars, he says, but it is difficult to keep them sold and to get repeat orders under existing service conditions. He emphasized the point that all must make sure of the facilities for care of the cars, and that is where the central station people can be of greatest assistance—in co-operating with the manufacturers. He thinks the new battery service schemes are going to have a tremendous helpful influence. He has already noticed the impetus given the business due to them.

The wise car buyer of to-day, says Mr. Kelly, is not so much interested in the first cost as he is in the operative cost, and battery care is the big problem from this standpoint.

Speaking of the electric taxicab, Mr. Kelly said that as an advertisement it is the greatest thing that the electric vehicle business has ever had. In five years he predicts that the electric cab will so far outnumber any other type that the other will be almost forgotten.

Touching upon the 10 to 15 per cent price reductions of all electric vehicles during the past year, Mr. Kelly emphasized the fact that the reductions are absolutely dependent upon the market to make a dollar. The manufacturers must have the production to make money. They cannot compete in price with the low-priced gasoline car, he says, and the great problem for all is to get together and get more soul into the business.

Northwestern Motor Co. at Pottstown

POTTSTOWN, PA., Oct. 21—The Northwestern Motor Co., this city, will lease space in a local plant to manufacture a motor. New York capital is back of the company and will send here part of the equipment of the Hazard Motor Co., Rochester, N. Y.

Lavine Gear Co. Is New Name

Co. Reorganized and Capacity To Be Doubled—H. A. Uihlein, of Schlitz, President

RACINE, WIS., Oct. 23—The Lavigne Gear Co., Racine, Wis., one of the most extensive manufacturers of steering gears for pleasure and commercial vehicles in the United States, has been reorganized and has put into effect an extension program which will practically double its capacity. The name of the corporation has been changed to Lavine Gear Co., to simplify pronunciation. Officers are: President and treasurer, Herman A. Uihlein, Milwaukee; vice-president, P. B. Wohlrab; secretary, D. L. Robertson; sales and advertising manager, E. M. Caskey. Mr. Uihlein is a member of the well known Uihlein family of Milwaukee, owning the Schlitz brewing interests. Mr. Wohlrab was for several years production manager of the Lozier Motor Car Co., Detroit, Mich., and Plattsburg, N. Y., and also formerly master mechanic of the Maryland Steel Co. Mr. Robertson was for ten years with Crerar, Adams & Co., Chicago, in charge of purchasing and orders. As secretary, Mr. Robertson will be purchasing agent and office manager of the Lavine company. Mr. Caskey formerly was engineering sales manager of the S. F. Bowser Co.'s Western division.

The Lavine company is experiencing a greatly increased demand for its products from both foreign and domestic sources and is enlarging the shops and installing much new equipment to accommodate the demand.

Woods Mobilette Buys International Cycle-Car and Accessories Co.

CHICAGO, ILL., Oct. 23—At meetings of stockholders of the Woods Mobilette Co., and the International Cycle-Car and Accessories Co., held about two weeks ago, action was taken whereby the Woods Mobilette Co., purchased the entire business, assets and good will of International Cyclecar and Accessories Co.

The latter company will, therefore, pass out of existence entirely just as soon as the necessary legal requirements can be complied with.

Automobiles Cut S. P. Earnings

NEW YORK CITY, Oct. 25—The Southern Pacific Co., in its annual report states that automobile traffic during the past year made big inroads on its earnings. About two-fifths of the \$8,600,000 loss in operating revenue, was due to passenger traffic in automobiles.

Zimmerschied Tells Safety First Men of Engineers' Contribution

Advocates Standard License Plates and Methods of Attaching, Standard Gearshift Gates, Location of Engine and Car Numbers and Anti-Glare Provision for Headlights

DETROIT, MICH., Oct. 22—On the second day of the Safety First Federation of America's convention, the two most important matters discussed were the model street traffic ordinance suggested principally by John Gillespie, Police Commissioner of Detroit, and the suggestions made by Chairman Karl W. Zimmerschied of the standards committee of the Society of Automobile Engineers, on the Contribution of Automobile Engineers to the Movement of Safety First.

Among the principal provisions in the ordinance is the one providing that the driver of any automobile must be licensed, owner or chauffeur, and that his minimum age be sixteen years, and that he be free from any physical ailment which possibly might affect him from properly handling a motor car. Special attention should be given to intoxicated drivers, who, when discovered, should have their license taken away.

Briefly stated the ordinance provides for:

1. Education and special instruction of policemen before assigning them to traffic duty.
2. Standard code of hand signals to be used by traffic officers.
3. Fixed locations for traffic officers at intersections to be distinctly marked.
4. Elimination of glare of head and side lights.
5. Use of muffler cut-outs to be prohibited.
6. Standardization of left-hand turns at intersections.
7. Near-side stops for street cars.
8. Rear lights on all horse-drawn vehicles.
9. Elimination of steps on all horsedrawn and motor trucks.
10. Standard color, size, design, and means of attachment for all street traffic signs, including school, hospital, church, safety zones, fire hydrants, railroad and street railway crossings, alley, mail box, playground, crosswalks, parking, etc.
11. Designation of safety zones and crosswalks as embodied in the Detroit plan of painting.
12. Education of the public to use crosswalks at intersections and authorizing police departments to control pedestrian travel as provided in section 2 of the Detroit traffic ordinance.
13. Standard traffic ordinance and code of regulations for adoption by all cities.
14. Licensing of drivers or operators of all motor vehicles.
15. Exclusive use of siren whistles on police and fire whistles.
16. Standardization of accident reports by municipalities.
17. Chain guards on vehicles driven by the side chains.

Most of these provisions were discussed previously by the traffic committee at its meeting held June 4 in Detroit.

Speaking as chairman of the standards committee of the Society of Automobile Engineers, Karl W. Zimmerschied suggested four regulations which he believes will help the safety first move-

ment a great deal. These suggestions are:

1. Standard license plates and methods of attaching them.
2. Standard gearshift gates or progression.
3. Standard location of engine and car numbers.
4. Anti-glaring provision for headlights.

In the course of his address, which was entitled "The Contribution of Automobile Engineers to the Movement of Safety First," Mr. Zimmerschied spoke as follows:

"It goes without saying that the very first concern of the automobile engineer in his individual capacity as a designer is the securing of increased dependability in the finished vehicle; especially in such details as steering and braking mechanism, commonly known as the control.

Improvement in Design

"Better steels, properly treated and used in adequate sections, are now the rule rather than the exception in such vital parts as axles, steering knuckles, reach connections and brake rods. Brake bands are lined with better materials than formerly, mounted so as to have the maximum life and holding power. Spring suspensions have been redesigned so as to make the car 'hold the road' better than formerly, and the center of gravity of the whole car has been lowered so as to decrease skidding and to lessen the liability of the vehicle to capsize.

"There is little or no mechanical advantage to be gained by locating the steering column either on the right or left, but the majority of engineers have adopted the left hand drive largely in the interest of the driver's safety, since this position decreases the chances of collision.

Standard Location for Numbers

"Taking the last first, the committee has adopted a standard position for car, chassis, and engine numbers so that police departments can identify vehicles with the minimum of trouble and loss of time. It recommends that the car number be indented in the right frame member, as near the spring horn as possible.

"The engine number shall be on the crankcase, as far forward as possible, on top and as near the middle, crosswise, as possible, preference to be given the right hand side. This ought to act as some deterrent against the stealing of cars, and certainly will be of great

benefit in restoring cars that have been stolen.

Standard License Plates

"Standards for the details of license plates, with recommendations designed to secure greater legibility and more adequate lighting of the same have passed the standards committee and are ready for final action by the society. We wish to lay considerable stress upon these standards, calling the attention, especially to those who have any influence in legislation to the great desirability of obtaining uniformity at least with respect to methods of affixing license plates throughout the various States.

"The maker's interest begins with the necessity for providing a standard bracket for attaching these plates; as long as almost every State uses a different size and shape, it is evident that the designing of a bracket which will accommodate all plates is exceedingly difficult, if not impossible.

"Many of the present brackets are either useless in themselves or require annoying operations on the part of the final user in order to attach the plates at all.

Standard Gearshift Gates

"One of the cardinal principles of safe driving is of course that all the manipulations necessary to control a car should be performed by the driver as a matter of unconscious habit. Steering, braking, accelerating, and shifting of gears must come as natural as walking, and in attaining this end, especially in the case of those who have to drive more than one make of car, the standard provisions for the control are of the greatest importance. The location of the clutch pedal on the left and the service brake pedal on the right has become practically universal; the successive positions through which the gear shifting lever has to go in progressing from one speed to another have been standardized by the society and are closely followed by the majority of cars using selective transmissions.

"It is most disconcerting to a driver who has become used to one of these standard progressions to try to drive a car with any other order, so that the society is using all its influence to obtain adherence to the preferred form.

"The accelerating pedal is sometimes located between the other two control pedals and sometimes to the right of both; it is not unusual for a man in a strange car to depress the accelerator pedal instead of the brake pedal and it is therefore desirable that this location should be standardized also. Some throttle and spark levers are opened or advanced with a counter-clockwise motion—often the opposite is the case. As in the case of accelerator pedals this practice should be unified also."

New York S. A. E. Talks Metallurgy

Hears That Recrystallization Is Non-Existent and Sees Movies on Tube-Making

NEW YORK CITY, Oct. 22—At the regular October meeting of the Metropolitan Section of the Society of Automobile Engineers held at the Automobile Club of America last night two lectures on metallurgical subjects were given. Prof. William Campbell of Columbia University made an address on the elements of metallography and C. F. Roland of the metallurgical department of the National Tube Co., delivered a lecture on steel tubing from ore to tube accompanied by three reels of motion pictures showing the progressive stages of manufacture from the time the ore is taken from the ground until the tube is finally stamped with the nameplate of the manufacturer.

Professor Campbell's talk brought out the difference between the chemical analysis method of determining the qualities of the steel and the newer and rapidly growing method of determining the merits of material by its structure under the microscope. The lecture was accompanied by a series of stereopticon views showing photo micrographs of different classifications of material. The granular structure of the metals was illustrated and the pith of the address brought out clearly how the inter-relationship of the granules determined the strength of the material, and its ability to resist various kinds of stresses.

Recrystallization a Myth

One of the most important points brought out in the address was the non-existence of the so-called re-crystallization which many engineers still believe to take place when the metal becomes fatigued. Professor Campbell illustrated by the photo-micrographs thrown on the screen that these so-called crystallization fractures are nothing more than breaks due to the development of a weak spot, caused by the action of one grain upon another, thus breaking up the closely knit structure necessary to strength. The distorted area of the metal loses its strength and the piece fails when the section has been reduced to such a degree that it is stressed to the ultimate.

The lecture by Mr. Roland was of an explanatory nature dealing with the subject shown by the three reels of motion pictures. The first picture shown, illustrated the prospective process of drilling the ground and then forcing by means of a stream of water samples of the ore to the surface. If the ore thus found is sufficiently rich in iron, mining operations are started. The next step shown

was the removal of the useless surface dirt and then the giant steel grab buckets, which pick up practically a ton of ore at a time and place it into the waiting ore cars in long trains of which it is conveyed to the coke fields where the blast furnaces are located. It is cheaper, Mr. Roland explained, to bring the ore to the coke, than it is to bring the coke to the ore, and since coke is necessary in the manufacture of pig iron, all the ore is transported first by car and then by lake steamer in this instance, to the coke fields.

The products of the blast furnace or the pig iron is refined into steel and the billets are rolled into longer billets and finally into skelt, or plating from which the tubing is manufactured, either by the butt welding process or the lap welding process. The two methods, as the names imply, indicate the manner of joining the ends of the plate in fastening the tube. In the butt welding the ends are brought together end to end and the weld completed while in the lap welding, one end is brought over the other and hammered into position at forging temperature. The pictures illustrated the rolling and welding operations step by step and finally showed the inspection of the finished tubes and the methods of testing.

Testing the Quality

Portions of the end of each tube are cut off and submitted to bending and flanging tests to determine the quality of the material and the efficiency of the weld. Tubes such as those used in boilers, or for other work where a high degree of strength and reliability are necessary, are clipped at both ends and subjected to a double test. Throughout the entire series of films, the audience was impressed by the great amount of automatic electric machinery employed and the absolute uniformity which seemed to be secured from the time that the ore left the mines, until the tube was ready for shipment from the huge mills.

Detroit S. A. E. Publicity Committee

DETROIT, MICH., Oct. 25—A publicity committee for the Detroit Section of the Society of Automobile Engineers has been appointed by chairman George W. Dunham of the section. The members are: H. W. Ford, chairman; Lee Olwell, K. W. Zimmerschied and J. C. Weed.

Ward Electric Shows Economy

NEW YORK CITY, Oct. 21—The Ward electric delivery car which left this city for Cleveland on Oct. 6 and arrived in the latter city on Oct. 17, covered the 733.8 miles with a total current consumption of 1564 amp.-hr. Only twenty-five charges of the battery were necessary.

Army Wants Motor Ambulances

Surgeon General Orders Convening of Board to Select Type—Horses To Stay

WASHINGTON, D. C., Oct. 23—Acting under the belief that the time has arrived when there may be greater dependence upon motor transportation as ambulances and for field sanitary units, the surgeon general of the army has directed the convening of a board for the purpose of ascertaining what type of automobile ambulance it is desired to adopt for the use of the medical department. The board is composed of Major A. W. Williams, Captain Percy L. Jones and Captain Arthur W. Christie, and all of the medical corps on duty in this vicinity.

There are about twenty automobile ambulances now in the service, all of them equipped with the standard ambulance body. Department officials point out, however, that this does not mean that there will be dependence upon motor transportation for the medical department to the exclusion of the animal-drawn vehicle, which is destined, they say, to remain of practical use in certain places where the motor vehicle cannot be used to advantage.

Propose Changes in Bay State Automobile Laws

BOSTON, MASS., Oct. 22—The Massachusetts Highway Commission is now making preliminary notes on what recommendations it will present to the next Legislature on motor topics, and one of the principal requests will be to have the law changed so that the initial suspension of a driver's license when convicted of operating recklessly or under the influence of liquor will be lengthened from the present period of 60 days to several months or a year.

"The board will also advocate again, no doubt a flat rate of 25 miles an hour on the State highways," says Commissioner James D. Synan. "Something should be done toward uniformity in the matter of city and town regulations, and the board will welcome some such legislation. Now there are so many conflicting regulations that drivers do not know where and how to proceed through some of our cities and towns without breaking a law. When this is done the number of accidents should be lessened. Our board is doing its share to try to lessen them by our suspensions and making people who have had accidents submit to an examination as to fitness sometimes, together with requesting those who drink to sign a pledge not to drive after drinking.

\$74,000,000 Exports in 1915

Increase Over 1914 Is \$36,000,-
000—Trucks Gain and Pas-
senger Cars Lower

WASHINGTON, D. C., Oct. 23—A statement issued by the Department of Commerce says that American automobile manufacturers doubled their sales abroad last year, their exports of automobiles and parts thereof in the year ending June 30, 1915, having aggregated over \$74,000,000, against \$38,000,000 in 1914, \$2,000,000 in 1904 and \$1,000,000 in 1902, the first year of record. The gains were most pronounced in the second half of the fiscal year, and if the record made by

July is maintained until the end of December, which seems probable from present indications, the total exports of automobiles in the calendar year 1915 will be well above \$120,000,000.

All parts of the world are buying American motor trucks and passenger automobiles, about eighty different countries being represented in the year's sales. Our motor trucks are being sold most largely in England, France, and Russia. In Greece, Denmark, Sweden, and Serbia sales have also reached unparalleled proportions. Increased sales are likewise being made in many countries far removed from the war zone, including Canada, Cuba, Central America, Java, Australia, British South Africa, and in our own territories of Hawaii, Porto Rico, and Alaska.

The year's exports of passenger au-

tomobiles were slightly less than those of 1914. Large gains in exports to the United Kingdom, Asiatic Russia, Cuba, Central America, the British West Indies, British Guiana, Venezuela, and British East Africa were more than offset by decreases occurring elsewhere, notably France, Germany, and various countries in Europe, South America, and Asia.

The constituent factors in the automobile export trade for the last two fiscal years are as follows:

Value of—	1914	1915
Commercial automobiles ..	\$1,181,611	\$39,140,682
Passenger automobiles ..	25,392,963	21,113,953
Automobile tires ..	3,505,267	4,963,270
Automobile engines ..	1,391,893	1,405,334
Automobile parts ..	6,624,232	7,853,183
Total exports to foreign countries ..	\$38,095,966	\$74,476,422
Total to Alaska ..	68,435	91,381
Hawaii ..	1,285,258	1,514,585
Porto Rico ..	686,906	775,879

A complete record of the United States export trade in automobiles is contained in the table which follows. It shows the number of automobiles of each class exported to the different countries in the fiscal years 1914 and 1915 and the value of the exports in the latter year, expressed in thousands of dollars.

Multibestos Maker Buys Former Walpole Plant

FRAMINGHAM, MASS., Oct. 23—The Standard Woven Fabric Co., this city, maker of Multibestos products and rubber specialties, has purchased the entire plant formerly operated by the Walpole Tire & Rubber Co. at Walpole and will take possession about Dec. 1. This plant will be used for the making of the company's own asbestos yarn sent direct to it from its asbestos mine. Part of the plant will be used for the manufacture of mechanical rubber goods, friction tapes, splicing compounds and other products.

F. J. Gleason, formerly of the Walpole company, will be in direct charge of manufacturing.

Anderson Rolled-Gear Plant in New Hands

TOLEDO, OHIO, Oct. 25—The Shaw-Kendall Engineering Co., this city, has signed a contract to take over the plant of the Anderson Rolled Gear Co. of Cleveland, and will manufacture the patented gears controlled by the Cleveland company. The Cleveland plant at which the experimental work has been done will be moved to Toledo, where the local concern will employ 1000 men within a year.

Columbia Commercial Car Moves

PONTIAC, MICH., Oct. 26—The Columbia Commercial Car Co., which is to locate here, is bringing its machinery from Kalamazoo, Mich., along with an order for fifty trucks to be delivered at the earliest possible date. Work will be begun at the local plant within a very short time.

Exported to—	MOTOR TRUCKS		Value	AUTOMOBILES		Value	PARTS		Value
	1914	1915		1914	1915		1914	1915	
Total ..	784	13,996	39,141	28,306	23,880	21,114	6,624	7,853	
England ..	243	5,306	14,042	6,992	8,321	6,849	1,282	3,283	
France ..	2	4,990	13,514	1,427	451	253	179	481	
Russia, European ..	2	2,251	7,667	926	907	1,528	14	124	
Greece ..	1	142	427	25	36	28	21	2	
Belgium ..	1	100	365	244	12	15	9	14	
Denmark ..	1	44	25	263	219	156	9	16	
Italy ..	1	1	8	342	114	70	51	65	
Norway ..	2	3	5	145	123	89	2	16	
Sweden ..	1	10	18	324	137	109	6	4	
Austria-Hungary ..	3	4	314	4	2	5	1	1	
Germany ..	24	4	3	1,411	16	17	213	14	
Finland ..	1	4	106	17	9	3	3	1	
Scotland ..	1	11	25	143	83	23	29	1	
Ireland ..	1	7	2	159	157	8	3	3	
Netherlands ..	1	9	19	141	96	132	8	3	
Portugal ..	8	5	10	59	14	18	2	3	
Servia and Montenegro ..	10	6	4	2	3	3	6	7	
Spain ..	1	2	83	71	60	6	1	1	
Switzerland ..	1	2	79	2	1	1	1	1	
Turkey, European ..	1	8	35	9	6	6	1	1	
Gibraltar ..	1	64	20	18	10	10	1	1	
Azores and Madeira ..	1	20	43	3	2	2	1	1	
Bulgaria ..	1	5	5	3	2	2	1	1	
Iceland ..	1	3	4,377	4,127	3,723	3,664	2,741	1	
Canada ..	247	306	705	4	1	1	1	1	
British Honduras ..	1	14	29	118	176	131	28	41	
Central American Republics ..	13	8	14	155	70	67	42	31	
Mexico ..	12	1	1	5	17	12	4	4	
Newfoundland ..	1	21	35	297	1,359	746	48	101	
West Indies: Cuba ..	19	1	3	3	3	1	1	1	
West Indies: Danish ..	4	2	7	140	196	129	44	52	
West Indies: British ..	4	3	4	65	54	35	8	7	
West Indies: French ..	1	1	1	13	24	17	5	5	
West Indies: Dutch ..	1	1	2	11	28	15	4	4	
West Indies: Haiti ..	1	2	3	940	626	294	93	50	
West Indies: Dom. Republic ..	1	3	4	10	5	1	3	3	
Argentina ..	48	3	3	297	81	53	85	29	
Bolivia ..	1	3	3	195	86	51	22	27	
Brazil ..	13	3	1	79	39	35	20	10	
Chile ..	2	1	21	20	11	6	4	4	
Colombia ..	1	1	16	45	24	5	5	5	
Ecuador ..	1	1	7	9	4	1	2	2	
British Guiana ..	1	1	5	2	2	1	1	1	
Dutch Guiana ..	1	1	36	24	21	6	5	5	
Paraguay ..	3	2	183	45	26	21	14	14	
Peru ..	1	3	126	227	143	36	29	29	
Uruguay ..	12	3	28	9	7	2	1	1	
Venezuela ..	1	7	144	103	104	6	21	21	
Aden ..	7	1	2	2	2	3	45	45	
China ..	1	2	437	315	275	48	107	107	
French China ..	1	7	12	551	1,478	25	20	20	
Chosen (Korea) ..	7	7	262	77	70	4	4	4	
India ..	7	596	82	25	20	4	4	4	
Russia, Asiatic ..	7	1	290	105	87	15	15	15	
Straits Settlements ..	7	11	1	11	2	1	1	1	
Other British East Indies ..	7	1	3	96	28	36	26	26	
Dutch East Indies ..	7	1	37	13	10	5	2	2	
Hongkong ..	1	1	7	1	1	1	1	1	
Japan ..	1	1	26	7	1	1	1	1	
Siam ..	1	5	84	3,099	2,159	1,768	202	199	
Turkey, Asiatic ..	1	32	32	1,065	938	784	54	48	
Australia and Tas. ..	32	20	62	614	407	425	70	40	
New Zealand ..	39	27	46	8	7	8	5	5	
Philippine Islands ..	38	4	9	2	2	1	1	1	
French Oceania ..	4	12	40	1,618	695	731	157	100	
British Oceania ..	9	15	49	120	75	3	4	4	
British South Africa ..	12	1	32	42	21	6	7	7	
British East Africa ..	1	1	22	1	1	1	1	1	
British West Africa ..	1	1	63	25	11	3	3	3	
Egypt ..	1	2	77	40	24	5	6	6	
Morocco ..	1	1	1	1	1	1	1	1	
Other Africa ..	2	1	1	1	1	1	1	1	
German Oceania ..	1	1	1	1	1	1	1	1	

Note—The shipments to American territories included: Hawaii, 864 automobiles valued at \$972,000; Porto Rico, 548 valued at \$433,000; Alaska, 59 valued at \$80,000 in fiscal year 1915.

Reo to Add 10-Acres Floorspace

Plans to Partially Construct and Assemble Most 1915-16 Output in New Plants

LANSING, MICH., Oct. 26—The Reo Motor Car Co. is constructing new buildings and additions which will add between 10 and 11 acres of floorspace to the plant, and work is being rushed that the additional space may be utilized at the earliest possible moment. It is planned to partially construct and assemble most of the 1915-1916 output in the new building space.

It is believed that within the next month the addition to the engineering building will be completed. The new building is three stories, of fireproof construction. The assembly room and body room will have double the present floorspace, as will the machine room on the second floor. The blueprint room will be located in the new structure and the old blueprint room will be given over to the drafting department.

With the completion of the addition the company will make its own photographs. The studio, which will be located on the third floor, will have ample space for the showing of complete cars and allow various views to be taken.

The following departments will be enlarged with the completion of the addition: Designing, drafting, machine shop, body engineering, body finishing, chemical, physical and motor testing.

One of the largest buildings will be the new receiving warehouse, which will be of brick, three stories, 52 by 121 ft. A Grand Trunk railway spur already has been laid to this location which is east of Platt Street and north of the other Reo buildings, and the contract calls for a 20 ft. receiving dock along this spur. A basement under the building will be used as a general stock storage room, as will the first floor. The second floor will be utilized for body and paint storage and the third floor will be used as a repair storage room.

New Truck Plant Largest

The largest building is the new truck plant which will be 667 by 250 ft., one story. The foundation of this building has been completed, and work is being rushed on the placing of the new steel windows and the erection of the walls. According to R. H. Scott, vice-president and general manager, it has not been decided whether the truck plant on North Grand Avenue will be discontinued with the completion of the new building or whether both will be operated.

Work on the new building at Baker Street and Washington Avenue, which

joins the newly-erected assembly building, practically has been completed, and a portion of it already is in use. This building is of steel construction, 126 by 292 ft., three stories and basement, and will be used in the various assembling operations.

The present stock receiving room is undergoing the addition of two stories, and the excavation for the new Reo clubhouse is practically complete.

Detroit Steel Products Celebrates Record Breaking Business

DETROIT, MICH., Oct. 22—Officers and heads of department of the Detroit Steel Products Co. were entertained at a dinner given them by General Manager J. G. Rummey, at the Detroit Athletic Club. The reason was to celebrate the record-breaking business of the company. Practically all departments are working overtime and with night shifts. In the spring department there are three shifts and there is a 24-hr. working schedule. An average of 720 springs are turned out a day.

Chalmers to Add Again

DETROIT, MICH., Oct. 22—Further additions to the plant of the Chalmers Motor Co. have been decided upon, although several new buildings were completed only during the last few days. The new building now contracted for will be a four-story structure, 60 by 200 ft. to be used as machine shop and stock room. It will provide about 50,000 additional square feet of floorspace.

The convention hall is completed and will be inaugurated in conjunction with the annual Chalmers dealers convention, which will be held Nov. 15 to 17.

Strike at General Vehicle Plant

NEW YORK CITY, Oct. 21.—Machinists in the plant of the General Vehicle Co. plant in Long Island City to-day went on strike in sympathy with the strikers at the Schenectady plant of the General Electric Co., of which the General Vehicle Co. is a subsidiary.

It is stated that the strikers, numbering from 250 to 600, will not return until the 48-hr. week and other concessions which they asked for are given their fellow-workers at Schenectady. About 40,000 men are employed in the General Electric plants throughout the country.

Peerless Employees Strike

CLEVELAND, OHIO, Oct. 22—One thousand employees of the Peerless Motor Car Co. went on strike to-day. The strike comes because demands for the 8-hr. day and other concessions had been refused.

50,000 Model 83 Overlands

Motor of New Series To Be Block Type—Upholstery of Fabrikoid

TOLEDO, OHIO, Oct. 25—To date 50,000 model 83 Overland cars have been sold at \$750 in touring form and \$725 as roadster. Beginning the first week in November, shipments of the second series of 50,000 will be commenced by the Willys-Overland Co.

Several changes have been made in the model for this second series. Instead of having a motor with separately cast cylinders the power plant will be of the block type, with inclosed valves and removable cylinder heads. The bore and stroke remain the same, 4½ by 4½, also the five-bearing crankshaft. Another change is to be found in the upholstery. Instead of cloth, Fabrikoid will be used. Otherwise the cars will be identical with those of the first series.

Franklin Adds Three Buildings

SYRACUSE, N. Y., Oct. 25—The H. H. Franklin Mfg. Co., this city, has now under way additions which will increase its floorspace about 33 per cent. The additions will cost approximately \$500,000 when finished and will bring the total floorspace up to 10½ acres.

The first additional unit consists of a two-story building with basement, that will be devoted exclusively to the die-casting department, with a capacity of 5,000,000 die castings annually. This is now practically ready for occupancy.

The second unit, a two-story saw-tooth building, will be used for a machine shop, experimental department and chassis tests, furnishing 24,000 sq. ft.

The last addition will be six stories high and will represent approximately 136,000 sq. ft., costing \$200,000. It will be equipped about the first of 1916 and will be the largest plant in Syracuse when made a unit with a companion building already in use, according to the company.

Crowther Plant Nears Completion

ROCHESTER, N. Y., Oct. 24—Construction is rapidly progressing on the building being erected for the Crowther Motor Co. at Ridgway and Woodrow Avenues, this city. The first unit of what is ultimately intended to be a large plant is 145 by 150 ft., with a concrete floored shipping platform 20 ft. wide. The building will be completed for occupancy by Dec. 1. The company will manufacture a low-priced runabout, touring car and light delivery wagon, featuring the roller friction drive developed by C. E. Duryea.

gasoline to compete with the 59 deg. gravity sold by Standard Oil. In consequence, the company offers a new grade, designated 59 deg. gravity gasoline. The new scale of prices now in effect, is as follows:

Gravity	Filling Station (Cents)	Tank Wagon Delivery (Cents)	Tank Wagon, 100 Gals. Delivery or More (Cents)
59 degrees...	12.5	11.6	10.6
62 degrees...	13.5	13.0	12.0
65 degrees...	16.5	16.0	15.0
70 degrees...	19.5	19.0	18.0

It is expected that the other independent jobbers, four in number, will follow suit in order to make uniform the prices for fuel in competition with the Standard. Nearly 125 filling stations are operated by the jobbers in various parts of Milwaukee.

Gasoline Up in Indiana

CHICAGO, ILL., Oct. 23—The Standard Oil Co. of Indiana will advance the price of gasoline 1 cent to 12½ cents and to 11½ cents for 100-gal. lots. The price of refined oil will be raised ½ cent to 7 cents.

142,000 Tons of Rubber Predicted

AKRON, OHIO, Oct. 23—A Goodyear Tire & Rubber Co. expert states that the world's production of crude rubber for this year will reach 142,000 tons, a substantial increase over 1914. Of this, 75,000 tons will be used in the United States, and fully one-half of it will find its way to the rubber factories of Akron. The acreage of plantation or cultivated rubber has increased from 75,000 in 1905 to about 1,330,000 in 1915.

Plantation rubber now comprises about two-thirds of the world's output.

General Advance in Securities

Firestone Tire with 145-Point Rise Features Market—Motor Issues Strong

NEW YORK CITY, Oct. 25—Automobile securities last week closed with unprecedented gains, ranging from a fraction to 145 points. Tire issues, especially, showed unusual strength. Firestone Tire common which reached the high mark of 804 on Friday, closed the next day at 720 at a record gain of 145 points. This represents a gain of 460¼ points in the last six months. No early realignment of the stock is said to be contemplated. Excess earnings are to be devoted to extending the plant and not to big dividends, officials of the company state.

General Motors, after a 15-point drop, rose last week to 372, a gain of 46 points. Studebaker, Overland and Maxwell also showed substantial gains, there being a scarcity of these issues for sale. Chevrolet, stock, which will be ready for delivery Oct. 27, closed on Saturday at 125, a drop of 5 points. Studebaker common went up 27 points, Overland 11 points and Maxwell 13 points. The latter stock was one of the strong features of the market. It is expected that the earnings for the current year may be as high as 15 per cent on the common stock. It is understood that the company has more than earned the full year's dividend on the first and second preferred stocks in the first three months of the current fiscal year, so that all earnings for the bal-

ance of the year will accrue to the common stock.

Most of the tire issues showed gains. Kelly-Springfield common rose 32 points; Goodrich, 1½; Goodyear 2, and Miller Rubber, 7 points.

A majority of the issues in the Detroit markets showed gains. General Motors closed at 375 with a gain for the week of 60 points. Studebaker common rose 32½ points and Continental Motor, 20 points.

\$3,000,000 Bearing Co. Formed

DOVER, DEL., Oct. 23—The Killian Roller Bearing Corp., has been organized to manufacture roller bearings. Its capital is \$3,000,000. The incorporators are: H. E. Latter, H. P. Coffin, and C. M. Egner.

\$250,000 Tire Company Formed

CLEVELAND, OHIO, Oct. 23—The Mason Tire & Rubber Co. has been incorporated with a capital of \$250,000 to manufacture automobile tires and inner tubes, and other rubber articles. The incorporators are: D. M. Mason, M. B. Mason, Robert G. Berlekemp, W. E. Sexton and O. M. Mason.

Victor Rubber Capital \$400,000

SPRINGFIELD, OHIO, Oct. 23—The capital stock of the Victor Rubber Co. has been increased from \$150,000 to \$400,000 to allow for improvements and additional equipment.

International on War Orders

PLAINFIELD, N. J., Oct. 23—The International Motor Co. has closed an order for 700 5-ton trucks for Russia.

Automobile Securities Quotations on the New York and Detroit Exchanges

	1914 Bld	1914 Asked	1915 Bld	1915 Asked	Wk's Ch'ge
Ajax-Grieb Rubber Co. com.	300	..	..	..	..
Ajax-Grieb Rubber Co. pfd.	101	..	..	..	..
Aluminum Castings pfd.	102	..	..	..	..
J. I. Case, pfd.	79	81	..	..	..
Chalmers Motor Company com.	155	165	-15	..	..
Chalmers Motor Company pfd.	102	104	+3½	..	..
Chevrolet Motor Co.	125	130	-5	..	..
Electric Storage Battery Co.	71	72	..	..	..
Firestone Tire & Rubber Co. com.	720	750	+145	..	..
Firestone Tire & Rubber Co. pfd.	112	114	..	..	..
General Motors Company com.	372	374	+46	..	..
General Motors Company pfd.	112	114	..	..	..
B. F. Goodrich Company com.	77½	79	+1½	..	..
B. F. Goodrich Company pfd.	110	111	+1	..	..
Goodyear Tire & Rubber Co. com.	332	337	+2	..	..
Goodyear Tire & Rubber Co. pfd.	110	112	+1½	..	..
Gray & Davis, Inc. pfd.	46½	48½	+14	..	..
International Motor Co. com.	68	72	+8	..	..
International Motor Co. pfd.	247	256	+32	..	..
Kelly-Springfield Tire com.	91½	93	+1½	..	..
Kelly-Springfield Tire 1st pfd.	225	235	..	..	..
Kelly-Springfield Tire 2nd pfd.	74	75½	+13	..	..
Maxwell Motor Company com.	97	99	+1	..	..
Maxwell Motor Company 1st pfd.	56	57	+6	..	..
Maxwell Motor Company 2nd pfd.	235	242	+7	..	..
Miller Rubber Company, com.	109	110	..	..	..
Miller Rubber Company pfd.	..	..	..	..	..
New Departure Mfg. Co. com.	135	140	-5	..	..
New Departure Mfg. Co. pfd.	100	104	-1	..	..
Packard Motor Car Company com.	440	460	+5	..	..
Packard Motor Car Company pfd.	122	130	..	..	..
Paige Detroit Motor Car.	92	94	..	..	..
Peerless Motor Car Co. com.	55	56	+1	..	..
Peerless Motor Car Co. pfd.	93½	94½	+1½	..	..
Portage Rubber Co. com.	13	17	..	..	..
Portage Rubber Co. pfd.	19½	21	..	..	..
Regal Motor Co. pfd.	38½	40	..	..	..
*Reo Motor Truck Company.	74½	76½	-1½	..	..
*Reo Motor Car Company.	..	..	..	..	..
Splittorf Electric Co. pfd.	..	..	..	..	..
Stewart-Warner Speed. Corp. com.	..	..	..	..	..

No quotations available at this time on account of war.

	1914 Bld	1914 Asked	1915 Bld	1915 Asked	Wk's Ch'ge
Stewart-Warner Speed. Corp. pfd.	106	..	..	..	..
Studebaker Corporation com.	188	189½	+27	..	..
Studebaker Corporation pfd.	111	113	+1	..	..
Swinehart Tire & Rubber Co.	90	92	..	..	..
Texas Company	162	164	-3	..	..
U. S. Rubber Co. com.	53½	54½	+½	..	..
U. S. Rubber Co. 1st pfd.	106	107	+½	..	..
Vacuum Oil Company	215	220	..	..	..
White Company, pfd.	110	..	..	..	..
Willys-Overland Co. com.	258	260	+11	..	..
Willys-Overland Co. pfd.	108	110	..	..	..

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

Chalmers Motor Co. com.	97	..	165	-2
Chalmers Motor Co. pfd.	94½	100	104	+1
Continental Motor Co. com.	155	180	340	+20
Continental Motor Co. pfd.	..	75	90	+3
General Motors Co. com.	..	64½	375	+60
General Motors Co. pfd.	..	83	112	-13½
Maxwell Motor Co. com.	10½	11½	71	+12½
Maxwell Motor Co. 1st pfd.	33½	36	97	+1
Maxwell Motor Co. 2d pfd.	13½	16½	53½	+6½
Packard Motor Car Co. com.	..	103	..	-3
Packard Motor Car Co. pfd.	90	..	100	..
Paige-Detroit Motor Car Co.	..	..	440	+5
*Reo Motor Car Co.	20½	..	38½	+½
*Reo Motor Truck Co.	10½	..	19½	+20½
Studebaker Corp. com.	..	..	190	+32½
Studebaker Corp. pfd.	..	..	109	+3

INACTIVE STOCKS

*Atlas Drop Forge Co.	21	..	29	..
Ford Motor Co. of Canada.	500	1450	..	-50
Kelsey Wheel Co.	185	..	205	..
*W. K. Prudden Co.	18	20	22	+½
Regal Motor Car Co. pfd.	25	..	21	..

*Par value \$10.

N. A. A. J. Closes 4 Day Convention

50 Accessory Manufacturers Represented—Jobber and Manufacturer Defined

KANSAS CITY, MO., Oct. 22—The National Association of Automobile Accessory Jobbers, in which there are about fifty accessory manufacturers as associate members, concluded its four-day autumn meeting to-day with excellent results. Several trade abuses received attention and progress was made toward a better condition in the field of the jobber and manufacturer.

One of the important works was the compilation of a list of jobbers; there are 254 in the list, but it may be changed if the future develops a necessity for alteration. This will eliminate the dealer or would-be jobber who in the past has been able to secure a syndicate catalog or other credentials and has secured a jobbers' price from the manufacturer. These jobbers' prices, it was stated, have in many cases been used to cut prices under the legitimate dealer, the goods being sold to the consumer instead of being jobbed. Both jobber and manufacturer were defined as follows:

Definition of a Jobber

A jobber of automobile accessories is one who buys in bulk or quantity for re-sale to established retail dealers in accordance with established trade methods. It is required that the major portion of the business be wholesale, and that he maintain sufficient general stock to meet the requirements of his trade.

Definition of a Manufacturer

An eligible manufacturer is one who produces one or more accessories on which his policy is to establish a consumer's, a dealer's and a jobber's scale, does not solicit consumer's business and maintains his own scale to both dealer and jobber. Legitimate exceptions to be considered according to established customs of the trade conditions of each member.

Future dating was condemned as unbusinesslike and a burden on the seller, who by this practice is obliged to carry the obligations of the buyer for a term of months without compensation.

The syndicate catalog was condemned, despite the eloquent plea made on the floor by a representative of a Chicago catalog publisher. It was held that this catalog, which can be bought in quantities, by a jobber or dealer, is often used by a non-jobber to get jobber's prices. The jobbers agreed that the use of a general catalog of this description by all jobbers would submerge the jobber's individuality.

Especial condemnation was accorded to the syndicated catalog of some jobbers. The manufacturer is often, it was stated, held up for payment for the space occupied by his goods. This was aimed at one jobber in particular. The only relation between the manufacturer and such catalogs in the future will be the furnishing of standard electrotypes for use in their pages. No payment will be given for their use and no inserts will be furnished.

To Support Stevens Bill

The Stevens bill, which would permit the manufacturer to maintain prices on his goods, was discussed by G. A. Waddle of the Goodyear Tire & Rubber Co., and after his address the association went on record as in favor of it. Members elected to urge their congressmen to support it.

Mail order houses and leagues were placed under the ban and the members ruled that goods should not be sold to them. It was also voted that there is no field for purchasing syndicates.

The member who has legitimate branches will not be required to take out additional memberships for his branches.

The next meeting will be held in New York, Jan. 7 and 8 and 10 and 11, the last two days of the show and the first two days of the following week. The first two days of the meeting will be taken up by committee work and Jan. 10 and 11 by open sessions.

At this time the association will bring up the question of: What is a proper discount for the jobber? Figures given at the convention showed that it costs 17½ per cent to do business and that unless the jobber gets at least 35 per cent on his selling price he cannot make money. A seal and insignia are to be prepared.

Winter Business Problems

A valuable discussion centered around winter business, led by H. R. Williams of the Gibson Co., Indianapolis, a jobber, and William K. Norris of the McQuay-Norris Mfg. Co., St. Louis, a manufacturer.

Williams showed a curve of the business of three jobbers, which curve went away up in the summer and slumped far down in the winter. The overcoming of this difference is the problem.

Both manufacturers and jobbers agreed that winter business must be stimulated, and Williams proposed an installment repairs plan, which he said he and his salesmen worked with some success last winter. The salesmen went to garagemen in the smaller towns of the Middle West, where many of the garages close up in the winter, and urged the repairmen to get cars in for overhaul during the winter. The car owners paid for this work in monthly installments and the shop was kept busy. Incidentally this developed some busi-

ness in accessories and supplies for the jobber; seventy garages, that would otherwise have closed, were kept open.

To Boom Winter Driving

Williams and Norris both recommended a propaganda in favor of the use of cars in winter. Manufacturers of cars have in some instances run advertising of this kind, the McQuay-Norris company itself has run some, and it was urged that every manufacturer of accessories and cars do likewise. There was laid out a wide field of operation for salesmen in missionary work of the kinds mentioned.

Following the sessions the McQuay-Norris Mfg. Co., took fifty members to St. Louis on a special train of Pullmans to be the company's guests in that city. The entertainment included an inspection of the factory, golfing, dinners and theaters.

Dixie Tourists on Florida's Sandy Roads

LIVE OAK, FLA., Oct. 20—Swaying over the wet, sand highways of Florida, the ten cars participating in the first inspection trip of the Dixie highway, covered 97 miles to-day in their run from Tallahassee to Live Oak, which is about half way between the capital of the State and the metropolis on the Atlantic seaboard.

The roads of Florida in this section of the State are several stages removed from boulevards, being composed mostly of sand with some short stretches of red clay. In dry weather the cars travel in deep ruts. When it rains hard, as it did to-day, the highways are a combination of sticky mud and water. Little provision has been made for drainage and for the greater part of the way the highways through the dense pine forests are too narrow to permit machines to pass. There are some places on the primitive trails where the tops scraped against the trunks of trees.

Reach Jacksonville

JACKSONVILLE, FLA., Oct. 21—For the first time since the Dixie highway tourists left Chicago and the shores of Lake Michigan fourteen days ago, the motorists gazed upon a large body of water this afternoon when Jacksonville, cooled by the breezes of the Atlantic Ocean, was reached after an arduous 87-mile trip from Live Oak, last night's stop.

The run across the northern counties of Florida, where the natives apparently are living a hand-to-mouth existence, was made over soft sand roads through which the cars staggered on low speed. An attempt had been made by the good road boosters of the section to make the going less tortuous by scattering pine needles, sawdust and pine shavings on the pristine trails through the turpentine

camps and practically untraveled swamp land.

Northern Florida does not lack good roads enthusiasm. This was evident all along the route and at every stop, where a rousing welcome was extended the tourists. This section of the State, however, is shy on funds and because of the small population, bonding the counties for any large amount is impossible. Baker County, for example, has 30 miles of Dixie highway, more miles than any other county through which the Chicago-Miami thoroughfare passes. But Baker County is 30 miles square and has a population of only 4,000, of which number but 500 are land owners.

Maxwell Makes Detroit to Indianapolis and Return in 20:1

DETROIT, MICH., Oct. 21—From Detroit to Indianapolis and return in 20 hr. and 1 min. for the 597.2 miles, is the run made by Ray McNamara, of the engineering department of the Maxwell Motor Co. in a Maxwell stock car. He was checked at the start and finish by W. D. Edenburn, local representative of the contest board of the A. A. A., while in the Indiana city the checking was done by Jack Baci, A. A. A. representative for Indiana. On the run to Indianapolis the 298.6 miles were covered in 8 hr., 58 min., or an average of 33 m.p.h. This run was 1½ hr. faster than the fastest railroad run. The start was made at 4.11 a. m. from the Maxwell headquarters on Woodward Avenue and McNamara reached Indianapolis at 1.09 p. m. After a stop of 14 min. he restarted and arrived here at 12.26 a. m.

Tom Orr also made a fast trip in another Maxwell stock car, although he was considerably delayed by a series of tire troubles en route.

Henney Buggy Will Build Bodies

FREEPORT, ILL., Oct. 23—The Henney Buggy Co., this city, will hereafter devote its plant largely to the manufacture of bodies for commercial trucks to be attached to Ford chassis. After a series of experiments, the plant has turned out a line of models to suit various industries, ranging from the small package box or open body that can be fastened at the back of the seat on the Ford runabout, to the large steel paneled-inclosed body that is used largely by clothing, dry goods, and laundry firms, the bodies ranging in price from \$18 to \$100 according to the requirements of the trade.

Master Carburetor on Owen

DETROIT, MICH., Oct. 25—The Master Carburetor Corporation announces that the Owen Magnetic Co., New York City, which makes the Owen cars, has contracted for Master carburetors as standard equipment.

Aluminum Alloy Piston for Fords

McQuay-Norris Mfg. Co. To Sell Set with Leak-Proof Rings for \$30

ST. LOUIS, MO., Oct. 22—The McQuay-Norris Mfg. Co., this city, maker of Leak-Proof piston rings, has announced a die-cast aluminum alloy piston, completely equipped with Leak-Proof piston rings and suitable for Ford cars. The company has adopted a new alloy, a product of the French patented Cothias process, which is composed largely of aluminum and known to the trade as Lynite.

The conductivity of Lynite, it is stated, is calculated at three times that of cast iron and coefficient of friction is several per cent less than that of cast iron.

The company sells four Lynite pistons for \$30. This equipment will be in the hands of jobbers throughout the country in the near future and can be had for Ford motors that have been rebored to 0.031 oversize.

Miller Aluminum Alloy Carburetor

LOS ANGELES, CAL., Oct. 19—Harry A. Miller, this city, has placed a new carburetor on the market known as the Miller. It is constructed of Miller metal, an aluminum alloy discovered while experimenting on a carburetor for military aeroplanes.

Aluminum Piston Ring Tried

LOS ANGELES, CAL., Oct. 24—The Harry A. Miller Mfg. Co. has run a successful 12-hr. test of a new aluminum alloy piston ring in a motor with pistons also of aluminum. The new ring is a double, concentric pattern with light wall pressure and it is said that the effect of the run was merely to put a gloss on the surface of the rings.

15 per Cent Raise for Rubber Men

AKRON, OHIO, Oct. 25—About 1500 machinists employed by Akron rubber companies and allied industries were notified to-day that their wages would be increased 15 per cent. The increase is made voluntarily by the employers and adds about \$1,000 a day to the income of local machinists.

Goodyear Sales Officials Meet

DETROIT, MICH., Oct. 22—A conference was held this week of the Detroit district sales representatives of the Goodyear Tire & Rubber Co. Business conditions and policies were discussed. Among the officials who were present

were C. W. Martin, manager of the automobile truck department at the plant in Akron, Ohio; H. G. Palmer, assistant manager of the automobile tire department in Akron, R. S. Burnham, special manufacturers representative, R. H. Daniels, special sales representative from Akron; E. F. Jackson, district manager; C. W. Hockler, assistant district manager; W. A. Hazlett, city manager; Harry Ammon, assistant city manager; J. P. Kennedy, manager of the local truck tire department; J. D. Harding, manager of the electric tire department.

\$10 a Week Buys a Ford

BOSTON, MASS., Oct. 23—What is claimed to be the first offer of its kind, a Ford club financed by the Dorchester Trust Co., has been started in Boston. It originated with Wilbur F. Beale, treasurer of the trust company, who worked out all the details and then began advertising it in the papers. The plans call for a person agreeing to deposit \$10 a week with the trust company from now on for a period of thirty or thirty-five weeks depending upon whether a runabout or a touring car is wanted. The bank will pay interest upon the deposits, but those who enter the plan must agree not to withdraw any of the money until the time limit is up. Then if the depositor decides that he does not want a car he can have his money and the interest back. It will be paid over to him and he will be sent to a garage if he decides he wants a car and there he will get a new Ford machine. If he wants any extras put on there is a clause in the contract requiring the depositor to continue putting \$10 a week in the bank until the extras are all paid for. If depositors prefer a more expensive car arrangements may be made later to carry along deposits for such a one.

Garford Men Study Worm Drive

PHILADELPHIA, PA., Oct. 22—Fifty owners and drivers of Garford trucks together with the Garford organization in Eastern Pennsylvania assembled at the salesroom and service station of the Garford Philadelphia Co., last evening, to study the construction and operation of the Sheldon worm gear drive axle used on the Garford truck. E. A. Shelly, advertising manager of the Sheldon Axle & Spring Co., discussed the salient points of worm gear constructions.

Manzel Pump Reduced to \$15

BUFFALO, N. Y., Oct. 21—The price of the two-cylinder engine-driven tire pump made by the Manzel Bros. Co., this city, has been reduced from \$20 to \$15. This price will include all fittings ready for immediate installation.

Factory Miscellany

To Make Trailers—The Lowell Cutter Co., Lowell, Mich., has added the manufacture of automobile trailers to its activities.

Timken Roller Bearing Adds—The Timken Roller Bearing Co., Canton, Ohio, is building an addition to its grinding room.

Beach Creek Co. Builds—The Beach Creek Auto Co., Beach Creek, Pa., will build a two-story factory. The estimated cost is \$25,000.

Guide Motor Co. Adds—The Guide Motor Mfg. Co., Cleveland, Ohio, will construct an addition to its plant at Madison and West 114th Street. The estimated cost is \$3,000.

Rutenber Adds—The Rutenber Motor Co., Marion, Ind., has contracted for the building of a third story to its plant, which will give the company 30,000 ft. more floor space and will increase its capacity 40 per cent.

McQuay-Norris Adds—The McQuay-Norris Manufacturing Co., St. Louis, Mo., maker of Leak-Proof piston rings, has purchased a tract just east of its present building at 2808 Locust Street and will begin the erection of an addition immediately.

Heron Adds—The Heron Mfg. Co., Utica, N. Y., will build a two-story addition, 85 by 150 ft., costing about \$100,000. This will practically double its present working force. The company recently received a large order for the

manufacture of a daily minimum of 4000 connecting rods for engines.

Milwaukee Engine Plant Started—The Milwaukee Auto Engine & Supply Co., 708 Winnebago Street, Milwaukee, Wis., has broken ground for its new factory and machine shop at Twenty-ninth Street and Meinecke Avenue. Work will be rushed so that occupancy may be taken early in December. The shop will cost about \$15,000.

Hoosier Auto Parts Co. Incorporates—The Hoosier Auto Parts Co., Muncie, Ind., has incorporated with a capital of \$100,000. The company is putting its plant into first class condition and operations are expected to commence the manufacture of parts for clutches, universal joints, etc., as soon as conditions will permit. A service department will be maintained for supplying repair parts on jobs formerly turned out by the B-T-K Gear & Engine Co., the plant of which was recently bought by the Hoosier company at a receiver's sale.

F.-W.-D. Adds—The Four Wheel Drive Auto Co., Clintonville, Wis., will enlarge its headquarters and add to its equipment. A new stock room 46 by 120 ft. is being built. A number of new heavy duty turret lathes, milling machines, boring bars and drill presses are being installed. There will be a new machine section, 54 by 120 ft. A new heat treating and tempering room, 20 by 40 ft. This latter room is completed. The company has just completed a building en-

tirely separate from the plant. This building is entirely of steel, is fireproof, and will be used for the storage of oils, grease and paints.

Wallis Tractor Plant to Move—The plant and headquarters of the Wallis Tractor Co., Cleveland, Ohio, owned principally by Racine, Wis., capital, will be moved to Racine by the end of October. The concern was organized about eighteen months ago by H. M. Wallis, president of the J. I. Case Plow Co., Racine, whose son is the designer of a farm tractor. A plant was established at Cleveland, in charge of the son. It is now desired to concentrate production at Racine, and a large part of the former Racine-Sattley Co.'s Racine works have been leased as a permanent home for the tractor company.

Kellar Tool Busy—The Kellar Pneumatic Tool Co., South Brooke Street, Fond du Lac, Wis., specializing in the manufacture of special tools, dies, punches and similar tools for manufacturers of motors and motor vehicles, has been obliged to put on a night shift to accommodate the extraordinary demand. According to Julius Kellar, Jr., general manager, the company has enough orders from one motor car manufacturer alone to keep the plant taxed to capacity night and day until the end of the year. Mr. Kellar also said that during the last four or five months the company has turned down from \$2,000,000 to \$3,000,000 worth of war business.

The Automobile Calendar

Oct. 29.....Indianapolis, Ind., Claypool Hotel, S. A. E. Meeting of Ind. Section.
Nov. 1-3.....Pasadena, Cal., Show, Hotel Green, Walter Hempel.
Nov. 2.....New York City, Sheepshead Bay Speedway, 100-Mile Race.
Nov. 12-20.....Providence, R. I., Show, State Armory, Rhode Island Automobile Dealers' Assn.
Nov. 18.....Arizona 150-mile Grand Prix.
Nov. 18.....New York City, S. A. E. Met. Sec. Meeting.
Nov. 22-27.....Binghamton, N. Y., Show, State Armory, Binghamton Automobile Dealers' Assn.
Nov. 29-Dec. 4....Electric Prosperity Week.
Dec. 6-11.....Springfield, Mass., Show, Auditorium.
Dec. 31-Jan. 8....New York City, Sixteenth Annual National Automobile Show; Grand Central Palace; National Automobile Chamber of Commerce.
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Jan. 3-9.....Importers' Salon, Hotel Astor.

Jan. 5-6.....New York City, S. A. E. Winter Session. Standards Committee Meeting.
Jan. 7, 8, 10, 11...New York City, Convention National Assn. of Automobile Accessory Jobbers.
Jan. 8-15.....Cleveland, Ohio, Show, Wigmore Coliseum, Cleveland Automobile Show Co.
Jan. 8-15.....Philadelphia, Pa., Show, Philadelphia Auto. Trade Assn.
Jan. 18-22.....Lancaster, Pa., Show, Conestoga Park Pavilion.
Jan. 22-29.....Chicago, Ill., Show, National Automobile Chamber of Commerce; Coliseum and First Regiment Armory.
Jan. 24-29.....Buffalo, N. Y., Show, Buffalo Automobile Dealers' Assn., Broadway Auditorium.
Jan. 29-Feb. 5....Minneapolis, Minn., Show, National Guard Armory, Minneapolis Trade Assn.
Feb. 7-12.....Kansas City, Mo., Show, Convention Hall, Kansas City Motor Dealers' Assn.
Feb. 14.....Des Moines, Ia., Show, Des Moines Auto. Dealers' Assn.

Feb. 15-20.....Omaha, Neb., Show, Omaha Automobile Show Assn.
Feb. 19.....Newark, N. J., Show.
Feb. 20.....Grand Rapids, Mich., Show, Klingman Furniture Exhibition Bldg., Automobile Business Assn.
Feb. 21-26.....Syracuse, N. Y., Show, Syracuse Automobile Dealers.
Feb. 29-Mar. 4....Fort Dodge, Ia., Show, Terminal Bldg., Ft. Dodge Automobile Dealers' Assn.
March 4-11.....Boston, Mass., Car and Truck Show, Mechanics Bldg.
May 13.....New York City, Sheepshead Bay Speedway Race.
May 30.....Indianapolis Track Race.
June 17.....Chicago Track Race.
June 28.....Des Moines, Ia., Track Race.
July 4.....Minneapolis Track Race.
July 4.....Sioux City Track Race.
July 15.....Omaha, Neb., Track Race.
Aug. 5.....Tacoma Track Race.
Aug. 18-19.....Elgin Road Race.
Sept. 4.....Des Moines Track Meet.
Sept. 15.....Indianapolis Track Race.
Sept. 16.....Providence Track Race.
Sept. 30.....New York City Sheepshead Bay Race.
Oct. 7.....Omaha Track Race.
Oct. 14.....Chicago Track Race.

Milburn Electric in Hartford—The Thomas A. Stewart Co., 69 Pearl Street, Hartford, Conn., has been appointed distributor of the Milburn electric in Hartford, Tolland, Litchfield and Middlesex counties. P. A. Wainwright of Hartford has been placed in charge of the automobile department. Temporary vehicle quarters have been secured in the Cole Service station at 67 Mulberry Street and later the company will be located in the remodeled Heublein garage. This is the initial appearance of the Milburn in this section of the State.

New Delion Tire Sub-Agencies—The Delion Tire Sales Co., 203 Allyn Street, has appointed the following sub-agents: W. E. Luettgens, South Manchester; H. H. O'Neil, New Britain; the B & S Tire Repair Co., Middletown.

Late Ohio Trade News—E. T. Paul, 123 Parsons Avenue, Columbus, Ohio, has taken the central Ohio agency for the Quaker line of tires.

The Cott-McKelvey Company, 448 North High Street, Columbus, has opened a service and repair department in conjunction with the Pullman and Jackson agencies.

The Griswold-Sohl Co., Columbus, has purchased the stock of Harry E. Smith, automobile dealer at 43 West Broad Street, which will continue the business at present at the same location. Later on the stock may be moved to the Griswold-Sohl Building.

Spokane News—The C. H. Hornburg Co. has moved into new quarters at 1421 Second Avenue. It will continue to handle the Regal line.

The latest addition is the Oldsmobile Co., incorporated for \$50,000, and composed of G. K. Marsh, F. M. Marsh, Henry Madigan and R. L. Strickie. This company will distribute Oldsmobile cars in eastern Washington, except three counties south of the Snake River, and all of northern Idaho. Headquarters are at 2122 Walnut street.

Opens Portland Tire Shop—G. M. Thomas, inventor of a stretchless inside tire, with stores in Los Angeles and San Diego, Oakland and San Francisco, Cal., has opened a tire shop at 82 Broadway, Portland, Ore.

Seattle Truck Co. Moves—Gerlinger Motor Car Co., distributors of Federal trucks, have moved into its new home, 2319-23 Fifth Avenue, Seattle.

Late Louisville News—Robinson Bros. & Co., 609 West Main Street, has acquired the agency for the Globe tire.

The Paige Motor Sales Co., 725 South Third Street, Louisville, Ky., has secured the agency for the Grant in the Louisville territory. This concern also handles the Paige.

The Breyfogle-Green Co., 1600 South Second Street, has secured the agency for the Allen.

The Louisville Auto Top Co. has opened an office and shop at 304 West Breckenridge Street. The concern, of which R. P. Bottorff is the manager, will make a specialty of auto trimming.

The National Auto Sales Co. will move on Oct. 15 from 728 South Fourth Street to 931 South Third Street, the former location of the Louisville branch of the Ford Motor Co. The National company will handle tire accessories and used cars, and will also engage in general repair and garage business.

New Savage Tire Agencies—The Savage Tire Co. of California, manufacturer of Savage tires, has established representation in Seattle with the Tyre Shop, 607 East Pike Street, Seattle, Wash., of which H. B. Wilbur is manager. The firm will act as distributor in Seattle and the territory north to the Canadian boundary line. The Savage Tire Co. also has established a distributing agency for the State of Oregon at Portland.

New Gasoline Stations in Los Angeles—With the completion of ten gasoline service stations in Los Angeles, the Ventura Refining Co. is now in better position to supply the trade. The service stations conform in detail to the style of architecture found in the old California missions. Aside from the unique style of architecture, a striking feature is an absence of gaudy signs. Only a small gold-lettered sign giving the name of the company and a mission bell, the trademark of Ventura gasoline.

Recent N. Y. Leases—The Jandorf Automobile Co., New York City, has leased the fourth floor of 239-241 West Fifty-sixth Street, and also the entire building at 303-307 West Fifty-ninth Street. The Hayes-Diefenderfer Co. has leased the second floor at 239-241 West Fifty-sixth Street. The C. T. Silver Co. has leased the top floor of 3-7 West Sixty-first Street. This company has moved to its permanent home in the Silver Building, corner North Broadway and Manor House Square, Yonkers. The Globe Tire Co., formerly at 228 West Fifty-eighth Street, has moved to 1853 Broadway, where larger quarters have been attained. The Holbrook Body Co. has leased 28,000 sq. ft. in the block Forty-third to Forty-fourth Street, Eleventh and Twelfth Avenues. The Ford Steel Pneumatic Shock Absorber Co. has leased space in the Circle Building, Columbus Circle. The Akron Tire Co. has taken space in the Thoroughfare Building, 1777 Broadway. The third floor at 319-320 West Forty-eighth Street has been leased to the Maxwell Motor Sales Co.

A lease has been made by the Kent Motors Corp. for one-half of the fifth floor in the building at 1700 Broadway. The Pullman Motor Car Co. has leased space at 1922 Broadway. The building

at 233 West Fiftieth Street has been taken by the Northern Pacific Motor Co.

Denver Trade News—The Platt-Fawcett Motor Co., 1249 Broadway, Denver, Stearns, Paige and Mitchell distributor for Colorado and Wyoming, has dropped the Mitchell and is handling the other two exclusively.

The Maines-Hough Motor Co., 439 Broadway, Colorado and Wyoming distributor for the Chevrolet and Monroe, has added the Mitchell agency for the same territory.

Shannon G. Loes, formerly sales manager for the Jones Motor Car Co., Inc., Richmond, Va., Cadillac distributor, has taken the position of sales manager for the Charles F. Cole Corp., 35 East Colfax Avenue, Denver, Pathfinder distributor for Colorado and Wyoming.

W. R. Woods, formerly Hupmobile agent in the Cripple Creek, Col., district, has been made sales manager for the Hupp Motor Sales Co., 1260 Broadway, Denver, Colorado and Wyoming distributor for the Hupmobile and Locomobile. George De Witt, formerly district salesman for the Cadillac in Texas and Louisiana, and also formerly well known as a Buick racing driver, has been made assistant sales manager and given charge of the city sales for the new Hupmobile concern.

The Denver local agency for the National has been transferred from the A. T. Wilson Auto Co. to W. F. Bell, 1616 Broadway.

Tom Botterill, 1278 Broadway, Denver, Dodge, Pierce and Hudson distributor for Colorado, Wyoming and Utah, has left for Detroit and Buffalo to visit the three factories. He is accompanied by Frank Botterill, a brother and manager of his Salt Lake City branch, which is known as the Tom Botterill Automobile Co.

W. W. Beeson, Colorado and Wyoming distributor for the National, has opened permanent headquarters at 1616 Broadway, Denver.

The Victor Auto Co.'s garage, Victor, Col., has been established as official Hupmobile service station, to work in connection with the Woods Auto Co., Hupmobile agent for the Victor district.

W. F. Bell has secured the Colorado and Wyoming territory for the Monarch, and has established headquarters at 1616 Broadway.

Plans have been completed by the Northwest branch of the Metz Company for a three-story fire proof building on East Pike Street, Seattle. The building will be completed by March 1 at an estimated cost of \$25,000.

Paterson Agency Moves—R. W. Vin- ing, who has the New England distribution for the Paterson, has just moved into new quarters in a building at 1121 Commonwealth Avenue, Boston, Mass.

Automobile Agencies Recently Established

Alabama			Glidden.....King.....E. O. Potter	St. Louis.....Elco.....Motor Car Repair & Supply Co.
Birmingham.....King.....Birmingham Motor Co.	Grinnell.....King.....Hawkeye Motor Sales Co.			St. Louis.....King.....Brinkman Motor Car Co.
Arkansas			Hebron.....Chandler.....Hayes Company	Shelbina.....Buick.....Byron Maupin
Hope.....King.....C. C. Spragins	Manilla.....Dodge.....J. J. Meehan			Shelbina.....Dodge.....J. C. Jewitt
Paragould.....Halladay.....W. S. Coleman & Sons	Mt. Ayr.....Briscoe.....H. Reynolds			
California			Mt. Ayr.....Hudson.....H. Reynolds	
Hollywood.....Apperson.....Ralph H. Clark	New Hall.....King.....N. Tvedt			
Los Angeles.....Enger.....Irving Motor Car Co.	Waterloo.....Abbott.....G. W. Campbell Co.			
Los Angeles.....Grant.....Bekins-Speers Motor Co.	Waukon.....Oldsmobile.....J. G. Minert Auto Co.			
Los Angeles.....Hollier.....Stone-Dancy Motor Sales Co.				
Los Angeles.....Kelly.....Springfield-Stone-Dancy Motor Sales Co.	Kansas			
Monrovia.....Chevrolet.....Foulke & Deatherage	Chapman.....Ford.....Arnold & Son			
Redlands.....Chandler.....Park Garage	Cimarron.....Ford.....Luther & Sons			
Redlands.....Oakland.....Park Garage	Coldwater.....Overland.....O. Taylor			
Redlands.....Chevrolet.....C. H. Clem	Great Bend.....Franklin.....F. Selle			
Colorado			Harper.....Paige.....Cunningham & Williams	
Akron.....Grant.....City Garage	Horton.....Buick.....Winterscheidt & Sautter			
Boulder.....Stearns.....F. Deckelman	Hutchinson.....Detroit.....Electric.....Walnut Street Garage			
Boulder.....Metz.....J. A. Outhier	Sterling.....Ford.....Farmers Supply Co.			
Buena Vista.....Haynes.....G. Danforth	Topeka.....Saxon.....Capital Auto & Supply Co.			
Burlington.....Grant.....R. Gates				
Calhan.....Metz.....J. E. Myers	Kentucky			
Canon City.....Grant.....D. R. Purdy	Carrollton.....King.....Thomas Garage			
Cheyenne Wells.....Metz.....H. N. Richmond & Sons	Louisville.....Scripps.....Callahan Motors Co.			
Colorado Springs.....Grant.....Ferguson & Ingersoll	Louisville.....Grant.....Paige Motor Sales Co.			
Colorado Springs.....Haynes.....E. D. Marr	Louisville.....Allen.....Breyfogle-Green Co.			
Delta.....Ford.....Allen Garage				
Denver.....Abbott.....J. M. Patrick	Maine			
Denver.....Paige.....Platt-Fawcett Motor Co.	Greenville.....Chandler.....W. R. Dailey			
Denver.....Denby.....A. C. Wagner	Portland.....Allen.....Paterson Garage Co.			
Eaton.....Grant.....C. W. Schultz	Maryland			
Elizabeth.....Grant.....R. Gates	Baltimore.....Standard.....Little Giant Sales Co.			
Fair Play.....Apperson.....H. Bergstrand	New London.....Apperson.....J. R. Brandenburg			
Flagler.....Metz.....Lewis Clark	Massachusetts			
Fort Collins.....Metz.....L. W. Van Dyke	Boston.....Westcott.....Bishop Motor Sales Co.			
Fort Collins.....Inter-State.....C. B. Mossman	Boston.....Pullman.....W. J. Hurley			
Fort Morgan.....Metz.....J. M. Scofield	Brockton.....Kissel.....Kissel-Kar Brockton Br.			
Ft. Collins.....Studebaker.....E. O. Sinar	Lowell.....Dodge Bros.....L. Rochette			
Ft. Morgan.....Grant.....A. C. Gillette	North Adams.....Oldsmobile.....M. O. Hagerty			
Grand Junction.....Ford.....R. G. Miller	S. Deerfield.....Oldsmobile.....T. J. Ahern			
Greeley.....Ford.....Universal Motor Car Co.	Springfield.....Haynes.....Springfield-Haynes Co.			
Greeley.....Inter-State.....C. C. Kersey	Weymouth.....Pullman.....C. R. Potter			
Greeley.....Metz.....F. P. Meeker	Worcester.....Jackson.....Greene Hale Co.			
Haxtum.....Metz.....M. Anderson	Worcester.....Stearns.....H. E. Plimpton			
Idalia.....Grant.....G. F. Conrad	Worcester.....King.....H. B. Pulsifer			
Iliff.....Metz.....W. F. Alexander	Michigan			
Leadville.....Haynes.....Cloud City Garage	Adrian.....Dodge.....Wilcox Hardware Co.			
Limon.....Grant.....R. Gates	Adison.....Maxwell.....Frank Barnaby			
Longmont.....Grant.....L. L. Swenson	Ann Arbor.....Overland.....Del. Begole			
Longmont.....Metz.....W. & Hyllon	Baldwin.....Ford.....G. F. Duffing			
Loveland.....Inter-State.....A. Straight	Baldwin.....Studebaker.....W. T. Wilkinson			
Loveland.....Grant.....C. W. Coffman	Battle Creek.....Paige.....C. H. Haagland			
Manzanola.....Grant.....Manzanola Mer. Co.	Carson.....Dodge.....Carson City Auto Co.			
Mattison.....Metz.....K. Kozola	Carson.....Oakland.....Carson City Auto Co.			
Montrose.....Dodge.....Silver Motor Co.	Charlevoix.....Haynes.....A. L. Hart & Son			
Ordway.....Studebaker.....E. W. Cleverly	Dowagiac.....Ford.....Scammon & Adams			
Ouray.....Ford.....W. F. Wheeler	Dundee.....Chalmers.....McIntyre Bros.			
Ouray.....Dodge.....Silva Auto Co.	East LeRoy.....Ford.....F. E. Riley			
Pueblo.....Metz.....F. Hamilton	Fair Haven.....King.....Guy La Bounty			
Pueblo.....Grant.....Richard Birge	Grand Ledge.....Studebaker.....R. Watson			
Pueblo.....Studebaker.....G. G. Russell	Grand Rapids.....Pullman.....S. A. Dwight			
San Luis.....Apperson.....W. S. Parrish	Grass Lake.....Studebaker.....E. A. Croman			
Steamboat Springs.....Dodge.....J. A. Brobeck	Hancock.....Eagle.....M. J. Carroll			
Steamboat Springs.....Grant.....A. H. Poppen	Hartford.....Regal.....C. G. Warren & Son			
Sterling.....Inter-State.....Ideal Auto & Mch. Co.	Ionina.....Dort.....Benedict Buick Co.			
Trinidad.....Metz.....J. I. Glendenning	Ionina.....Oldsmobile.....C. H. Welker			
Uma.....Grant.....O. E. Stimson	Ishpeming.....Buick.....A. J. Hasselblad			
Vilas.....Metz.....C. F. Wheeler	Kalamazoo.....Imperial.....O. Baker & Son			
Walsenber.....Metz.....C. B. Blanton	Lansing.....Auburn.....D. H. Mills			
Wray.....Metz.....McGinnis Bros.	Lansing.....Dort.....Dort Motor Sales Co.			
Connecticut			Litchfield.....Overland.....F. S. Sackett	
Norwalk.....Kissel.....F. E. Lockwood & Co.	Marcellus.....Dodge.....R. T. Loveridge			
Georgia			Marquette.....Buick.....Cleophas Meilleur	
Columbus.....Apperson.....B. Y. Hill Garage	Mt. Clemens.....Oakland.....E. H. Donald			
Illinois			Ontonagon.....Briscoe.....C. W. Brown	
Abingdon.....Maxwell.....Reynolds & Fields	St. Johns.....Briscoe.....Hunt & Allison			
Alton.....Haynes.....C. G. Luft	St. Johns.....Jeffery.....Steel & Valentine			
Bloomington.....Stearns.....Chalmers.....A. W. Neff	Sheldon.....Overland.....J. M. Wilson Auto Co.			
Cairo.....Chalmers.....A. W. Neff	Sheldon.....Hudson.....J. M. Wilson Auto Co.			
Champaign.....Milburn.....Knight.....C. W. Frey	South Lyons.....Dodge.....C. E. Arms & Son			
Chicago.....Elec.....R. C. Nelson	Minnesota			
Chicago.....Oldsmobile.....P. Lorenzen	Ada.....Allen.....Ada Auto Co.			
Collax.....Ford.....F. M. Hager	Aitkin.....Franklin.....Northwestern Service Co., Inc.			
Decatur.....Mitchell.....L. W. Cook	Buffalo Lake.....New Era.....Wm. Grunke			
Freeport.....Mitchell.....M. L. Miller	Chaska.....New Era.....J. G. Bierlein			
Jacksonville.....McFarlan.....Donald Joy	Cokato.....King.....Christofferson & Larson			
Jacksonville.....Jeffery.....Jacobs & Meyer	Duluth.....Munroe.....J. M. Ford			
Jacksonville.....Haynes.....W. C. Hamm	Duluth.....Rauch & Lang.....S. L. Potts			
Manito.....Oakland.....Frank Wilson	Duluth.....Knight.....S. L. Potts			
Mendota.....Chalmers.....Thier & Fahler	Duluth.....Pullman.....S. L. Potts			
Murphysboro.....Chalmers.....George Huthmaker	Hastings.....Kissel.....A. R. Walbridge			
Murphysboro.....Oldsmobile.....P. B. Outhouse & Co.	Luverne.....Allen.....W. Nelson			
Pekin.....Davis.....H. A. Reuling & Son	Luverne.....Hudson.....W. Nelson			
Rockford.....Paige.....F. Carlson	Minneapolis.....Herfi.....Brooks.....Eagle Motor Works			
Shirley.....Reo.....Charles Hutchinson	Morris.....King.....S. Stewart			
Springfield.....Oldsmobile.....White Garage	Redwood Falls.....Franklin.....C. D. Thompson			
Springfield.....Chevrolet.....C. E. Knecht	Red Wing.....Studebaker.....M. A. McNiff			
Strawn.....Dodge Bros.....Stottler Brothers	Rochester.....Dodge Bros.....R. N. Sweet			
Weldon.....Reo.....M. H. Shinneman	St. Clair.....Maxwell.....Leo Hardware Co.			
Indiana			Springfield.....Oakland.....B. F. Mowry	
Evansville.....Packard.....Walton Motor Co.	Virginia.....Dodge Bros.....Carl Shapiro			
Fort Wayne.....Westcott.....Furman Auto Co.	Winona.....Maxwell.....Gate City Motor Co.			
Iowa			Missouri	
Anamosa.....Kissel.....Anamosa Auto Co.	Centralia.....Reo.....L. & H. L. Roemer			
Cedar Rapids.....Vim.....P. Perley	Cape Girardeau.....Chalmers.....W. D. Black			
Des Moines.....Stearns.....Hal Wells	Flat River.....Chalmers.....B. A. Eaton			
Des Moines.....Kissel.....Guarantee Motor Co.	Kansas City.....Enger.....Packard-Missouri Co.			
Fonda.....Kissel.....Kenning Auto Co.	Springfield.....Stutz.....Joe Keet			
Montana			Nebraska	
Billings.....Oakland.....Batty Motor Co.	Cozad.....Oldsmobile.....W. Robertson			
Dodson.....Ford.....J. H. Moore	Fremont.....Apperson.....Hall & Steele			
Lewiston.....Oldsmobile.....J. W. Drake	Lincoln.....Kissel.....A. H. Meyers			
Nebraska			Omaha.....Enger.....Foshier-Enger Co.	
Cozad.....Oldsmobile.....W. Robertson	Omaha.....Moline.....Knight.....R. G. Davis			
Fremont.....Apperson.....Hall & Steele	New Jersey			
Lincoln.....Kissel.....A. H. Meyers	Bradley Beach.....King.....E. S. Thomas			
Omaha.....Enger.....Foshier-Enger Co.	Matawan.....King.....J. C. Bushnell			
Omaha.....Moline.....Knight.....R. G. Davis	New Mexico			
New Jersey			Albuquerque.....Metz.....F. E. Dearth	
Bradley Beach.....King.....E. S. Thomas	New York			
Matawan.....King.....J. C. Bushnell	Buffalo.....Hupmobile.....Buse-Patten Motor Car Co.			
New Mexico			Buffalo.....Inter-State.....Blackburn Sales Co.	
Albuquerque.....Metz.....F. E. Dearth	Buffalo.....King.....Mineola Garage			
New York			New York.....Enger.....Heiber Motor Car Co.	
Buffalo.....Hupmobile.....Buse-Patten Motor Car Co.	Rochester.....Kissel.....Wm. D. Havens			
Buffalo.....Inter-State.....Blackburn Sales Co.	Schenectady.....King.....G. B. Wells			
New York.....King.....Mineola Garage	Silver Creek.....Oldsmobile.....Wm. J. Dickerson			
Rochester.....Enger.....Heiber Motor Car Co.	White Plains.....Kissel.....Kissel-Kar Garage Co.			
Schenectady.....Kissel.....Wm. D. Havens	North Dakota			
Shelter Island.....King.....G. B. Wells	Flasher.....Overland.....F. Swanson			
Silver Creek.....Oldsmobile.....Wm. J. Dickerson	Velva.....Grant.....E. R. Teich			
White Plains.....Kissel.....Kissel-Kar Garage Co.	Ohio			
North Dakota			Alliance.....Alter.....E. R. Coleman	
Flasher.....Overland.....F. Swanson	Alliance.....King.....J. F. Brannon			
Velva.....Grant.....E. R. Teich	Bucyrus.....Enger.....F. J. Norton Sons			
Ohio			Columbus.....Madison.....Miller & Carpenter	
Alliance.....Alter.....E. R. Coleman	Portsmouth.....Vim.....R. S. Prichard			
Alliance.....King.....J. F. Brannon	Rayland.....Oldsmobile.....W. D. Hoge			
Bucyrus.....Enger.....F. J. Norton Sons	S. Charleston.....Oldsmobile.....Sullivan Auto Co.			
Columbus.....Madison.....Miller & Carpenter	Toledo.....Grant.....Union Supply Co.			
Portsmouth.....Vim.....R. S. Prichard	Xenia.....King.....Page-Maxwell Sales Co.			
Rayland.....Oldsmobile.....W. D. Hoge	Wyoming			
S. Charleston.....Oldsmobile.....Sullivan Auto Co.	Sheridan.....Grant.....W. C. Reid			
Toledo.....Grant.....Union Supply Co.	Oklahoma			
Xenia.....King.....Page-Maxwell Sales Co.	Oklahoma City.....Marion.....Sutter-Johnson Motor Co.			
Wyoming			Pennsylvania	
Sheridan.....Grant.....W. C. Reid	Addison.....Enger.....Straw & Dean			
Oklahoma			Germantown.....King.....Delmar Garage	
Oklahoma City.....Marion.....Sutter-Johnson Motor Co.	Harrisburg.....Studebaker.....Ford Sales Co.			
Pennsylvania			Hawley.....Dodge Bros.....Gottlieb Matter & Sons	
Addison.....Enger.....Straw & Dean	Hazleton.....Enger.....W. W. Wilmot			
Germantown.....King.....Delmar Garage	Lancaster.....Enger.....O. H. Shenk			
Harrisburg.....Studebaker.....Ford Sales Co.	Monessen.....Oldsmobile.....H. N. Oldert			
Hawley.....Dodge Bros.....Gottlieb Matter & Sons	Parkers Landing.....Apperson.....Gibson & Sorgen			
Hazleton.....Enger.....W. W. Wilmot	Philadelphia.....Kissel.....Baker-Price Co.			
Lancaster.....Enger.....O. H. Shenk	South Dakota			
Monessen.....Oldsmobile.....H. N. Oldert	Sinai.....King.....F. H. Folberg			
Parkers Landing.....Apperson.....Gibson & Sorgen	Texas			
Philadelphia.....Kissel.....Baker-Price Co.	Fort Worth.....Franklin.....G. L. Omohundro			
South Dakota			Houston.....Apperson.....Young & Dwire Co.	
Sinai.....King.....F. H. Folberg	Marble Falls.....Oldsmobile.....Marble Falls Garage			
Texas			Mesquite.....Kissel.....Humphreys & Vauston	
Fort Worth.....Franklin.....G. L. Omohundro	Vermont			
Houston.....Apperson.....Young & Dwire Co.	Burlington.....Kissel.....Todd & Tupper			
Marble Falls.....Oldsmobile.....Marble Falls Garage	Virginia			
Mesquite.....Kissel.....Humphreys & Vauston	Big Stone Gap.....Enger.....Dominion Motor Car Co.			
Vermont			Washington	
Burlington.....Kissel.....Todd & Tupper	Spokane.....Vellie.....Franklin Auto Sales Co.			
Virginia			Tacoma.....Enger.....W. E. Newton	
Big Stone Gap.....Enger.....Dominion Motor Car Co.	Walla Walla.....Hupmobile.....Alvin Coyle			
Washington			Wisconsin	
Spokane.....Vellie.....Franklin Auto Sales Co.	Eagle.....Oldsmobile.....Smart Bros.			
Tacoma.....Enger.....W. E. Newton	Eau Claire.....Vellie.....Murphy & Costello			
Walla Walla.....Hupmobile.....Alvin Coyle	Eau Claire.....Allen.....Murphy & Costello			
Wisconsin			Elkhorn.....Ford.....Smart Bros.	
Eagle.....Oldsmobile.....Smart Bros.	Fox Lake.....Chalmers.....Murphy Garage			
Eau Claire.....Vellie.....Murphy & Costello	Hartford.....Kissel.....Schauer Brothers			
Elkhorn.....Ford.....Smart Bros.	Janesville.....Chalmers.....Priepelt & Conway			
Fox Lake.....Chalmers.....Murphy Garage	Kewaskum.....Chalmers.....L. Rosenheimer			
Hartford.....Kissel.....Schauer Brothers	Manitowoc.....Chalmers.....L. J. Anderson Co.			
Janesville.....Chalmers.....Priepelt & Conway	Marion.....Kissel.....F. J. Haufe			
Kewaskum.....Chalmers.....L. Rosenheimer	Milwaukee.....King.....Lauson-Salestine Co.			
Manitowoc.....Chalmers.....L. J. Anderson Co.	Milwaukee.....Allen.....Lauson-Salestine Co.			
Marion.....Kissel.....F. J. Haufe	Milwaukee.....Westcott.....Collins Garage Co.			
Milwaukee.....King.....Lauson-Salestine Co.	Milwaukee.....Princess.....Milwaukee Motor Sales Co.			
Milwaukee.....Allen.....Lauson-Salestine Co.	Milwaukee.....Hollier.....Wells Garage Co.			
Milwaukee.....Westcott.....Collins Garage Co.	Minneapolis.....Stearns.....Knight.....Rauch & Lange Electric Car Co.			
Milwaukee.....Princess.....Milwaukee Motor Sales Co.	Oconto.....Studebaker.....Henry Bradley			
Milwaukee.....Hollier.....Wells Garage Co.	Oconto.....Jeffery.....H. Lingebach			
Minneapolis.....Stearns.....Knight.....Rauch & Lange Electric Car Co.	Platteville.....Dodge Bros.....The Eagle Garage			
Oconto.....Studebaker.....Henry Bradley	Sheboygan.....Chalmers.....G. & H. Motor Co.			
Oconto.....Jeffery.....H. Lingebach	Sheboygan.....Oldsmobile.....Prange Motor Co.			
Platteville.....Dodge Bros.....The Eagle Garage	Sheboygan.....Chevrolet.....Prange Motor Co.			
Sheboygan.....Chalmers.....G. & H. Motor Co.	Sargeant.....New Era.....Grimm Bros.			
Sheboygan.....Oldsmobile.....Prange Motor Co.	Watertown.....Dort.....Schauer Bros.			
Sheboygan.....Chevrolet.....Prange Motor Co.	Watertown.....Oldsmobile.....The Service Co.			
Sargeant.....New Era.....Grimm Bros.	Wyoming			
Watertown.....Dort.....Schauer Bros.	Basin.....Metz.....G. R. Hoover & Co.			
Watertown.....Oldsmobile.....The Service Co.	Dayton.....Metz.....R. W. Ratcliff			